The
Electrical Review

VOL. CXI. NOVEMBER 18, 1932. No. 2869.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to E.R. (1930) LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Fires on Ships

FIRE has not been directly responsible for many deaths relatively to the total number of casualties at sea, but its spectacular effects influence the public mind disproportionately. A major disaster at sea is followed by a spate of uninformed criticism, as Mr. Champness pointed out in a paper which he read recently before the N.E. Coast Institution of Engineers and Shipbuilders.

The recent destruction by fire of the *Georges Phillipar*, which involved the loss of nearly one hundred lives, was a case in point. The cause of the outbreak was (we might say "of course") immediately attributed by the lay Press to electricity. This was disproved in the subsequent inquiry, but a falsehood is notoriously difficult to overtake.

Although electricity is rarely responsible for a serious conflagration, it must be, like Cæsar's wife, above suspicion, as great things often turn on small matters. There appears to be some risk from the unauthorised use by passengers of small electrical appliances of their own without due regard to their suitability under the conditions prevailing at sea. We do not like the idea that has been put forward of preventing this by the installation of plugs of a non-standard pattern, but the employment of miniature lamps in connection with non-luminous heating devices has much to recommend it—and not only at sea; the use of calibrated fuses also might be extended to prevent the overloading of circuits.

Wrapped up in this question of confidence in the safety of the small uses of electricity is that of its reliability for bigger purposes, as safety is mentally associated with reliability. An article which we published last week indicated that British shipowners are in danger of losing their traditional place as pioneers; the thirty-two electrically propelled ships (thirteen oil-engine, twelve h.p.-turbine, and seven exhaust-turbine equipment) that are British built are not a large-enough proportion of the 200 to be found throughout the world to-day.

Mr. Watson, in his address to the Rugby Engineering Society, shows conclusively that we are technically well to the fore, and certainly the performance of electrically propelled vessels leaves no ground to doubt their reliability. Neither would electrical propulsion increase fire risk, for fires due to electrical causes are extremely rare in those parts of the vessel in which power is generated or used in large quantities, as the whole of the cables and plant are usually visible and under supervision.

The amount of smoke produced has hitherto tended to obscure the source of the fire and has added to the difficulties of its extinction. It now provides an opportunity for the photo-electric cell (which has already been demonstrated in large vessels). The cell can give warning, work chemical extinguishers, close air-baffles, and even check the coming and going of the patrols on their rounds. In such ways as this, as well as in the provision of the safest illuminant, electricity will prevent more fires than those which even the daily papers could possibly ascribe to its agency.

Progress in Argentina

WE have good reason for believing that a great deal of quiet but substantial effort is being made in the Argentine on behalf of British electrical manufacturing interests. Mr. H. C. Siddeley's appointment was made at the right time. The disposition of buyers in Buenos Aires has been to think more highly of the American and German electrical industries than they ought to think. This is being corrected as the facts concerning British electrical capacity become better known. Information concerning the development of our grid system is being received with much interest. The timeliness of present efforts to advertise what this country is ready to do

finds emphasis in the fact that the general slackness of business during the last two years has caused depletion of stocks of electrical products. Only a very slight improvement in trade conditions would mean an immediate call for replenishment; it would also warrant greater public works activity. The matter is of special interest just now as an Argentine trade delegation is on the way to this country.

An Example to Follow

THE view is held, backed by good authority, that while tariff arrangements with other parts of the Empire are so much to the fore, the electrical industry would stand to reap great advantage if appointments similar to that at Buenos Aires were made in Canada, Australia, and India. Delegates could watch events and see that full advantage were taken of any opportunities arising out of the rearrangement of trading agreements. Experience also goes to show that British engineering generally would find it profitable to emulate the example set by B.E.A.M.A. and appoint delegates of its own to give authoritative information on the many questions which are being raised by potential buyers. No doubt this subject has already exercised the mind of the British Engineers' Association in view of its interest in export trade.

The Grid on the Screen

THE Central Electricity Board's decision to film the construction of the grid indicates that one of the activities of that authority is to acquaint the public with its work, and it can be regarded as an encouragement to the electricity supply industry to take up with renewed vigour the task of educating the public. The industry has certainly not yet made proper use of the cinema. The C.E.B. picture will deal with generation and main transmission, in two parts, and we understand that it may be the first of a group of three films covering the entire industry. The initial work is regarded as of importance in that it will constitute a record of a national historical event. We coincide with this view, but we also attach much importance to the propaganda value of the scheme. The constructional work generally, and particularly such features as the Thames crossing towers, with sidelights depicting such operations as the production of insulators in a pottery, and the winding on site of the new 75,000-kW stators at Barking, should certainly be considered worth while by exhibitors and educational authorities.

Derby Cables

IN his speech delivered at the end of October at the Old Cromptonian Dinner Mr. F. Parkinson made reference to the expansion of operations of his company so as to form a great entirely British concern producing a complete range of electrical products. The connection established with the British Electric Transformer Co., Ltd., by the Crompton-Parkinson organisation was recently detailed here, and in our "Business and Industrial Notes" to-day the announcement of the acquisition of control of Derby Cables, Ltd., appears. This is taking place without change of general policy; it will mean an extension of the works; and there will be a full utilisation of the selling organisation of the mother company.

Salvation by Electricity?

WHATEVER be the causes of the present depression is electricity the way out? This question was introduced at a recent informal meeting of the I.E.E. by Mr. J. F. Shipley. The answer, of course, is that electricity alone is not *the* remedy but it may do much to help if it is given a proper opportunity. Furthermore, it may afford a good guide as to the course of the movement toward recovery, though statistics do not always carry their real explanation on the surface. The uninitiated might find difficulty in understanding why during depression the domestic load here has advanced while the industrial demand has fallen. The explanation of this is that we have been backward in our domestic electrical development and progress was overdue. When industry revives the public will have more money to spend and the demand for domestic electricity will increase at a greater pace than now. Mr. Shipley said that electricity, though it saved labour, had not done so at the expense of other industries; actually it had enormously benefited some trades. Furthermore, it has actually brought new industries into being and is doing so to-day.

An Electrical World

IT is encouraging to deduce from electricity consumption charts respecting many countries that better times are upon us. There is not the slightest reason to doubt the accuracy of Mr. Shipley's forecast that the electrical industry will continue to make ever-increasing advances. We do well to keep the whole world in mind in this connection. The speaker was able to show that in a number of very disturbed countries—Turkey, Spain, Mexico, Germany, and Argentina—the electricity generation statistics showed no backward movement. But we can go farther than that and feel sure confidence that in these and many other countries too, the demand will grow very rapidly in the course of the next ten years. There may be economic setbacks but the inherent merits of electricity destine it to meet certain needs of the whole civilised world. It has not yet had its full chance to pull its full weight in the development of vast resources which await the effort of mankind.

Our Overseas Trade

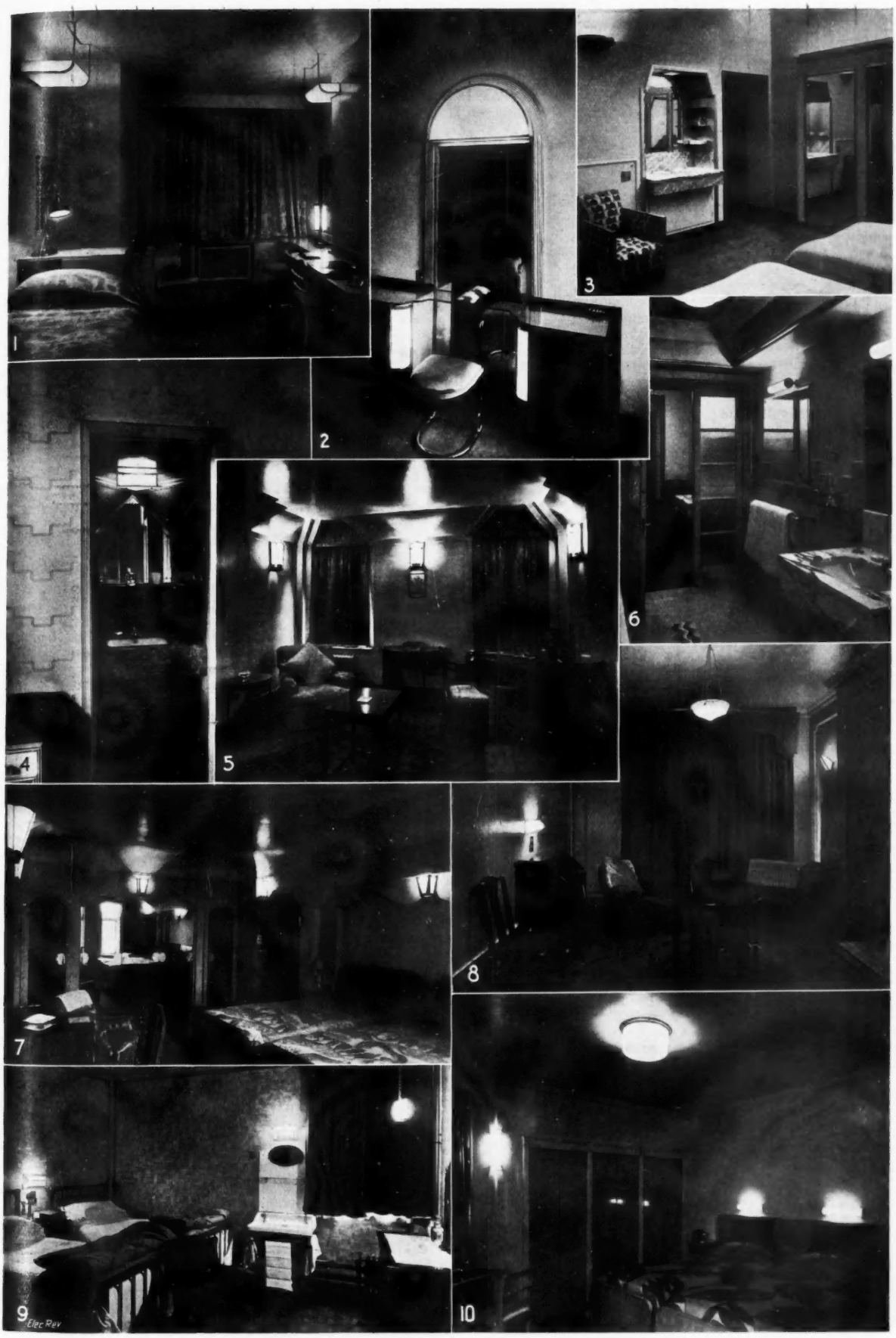
FIGURES relating to Great Britain's electrical imports during 1391 appear in this issue. Studying these against the export figures published last week, it would appear that in electrical goods and apparatus the balance of trade in favour of the United Kingdom fell from £6,650,000 in 1929 to £4,900,000 in 1930 and £6,250,000 in 1931; while in electrical machinery the balance in favour of the United Kingdom fell from £4,450,000 in 1929 and £4,530,000 in 1930 to £2,723,000 in 1931. In the latter group the decrease in the favourable balance was due much more to a fall in exports than to a rise in imports. In 1929 the lamp trade showed a favourable balance of £168,000 and in 1930 one of £27,000, but last year there was an adverse balance of £125,000. The radio valve trade resulted in an adverse balance of £3,000 in 1929, a favourable balance of £124,000 in 1930, and an unfavourable balance of £86,000 last year. In the trade in radio apparatus other than valves the unfavourable balance was £578,000 in 1929, £176,000 in 1930, and £874,000 in 1931.

Rural Labour

A POINT in favour of erecting manufacturing works in rural areas was mentioned to us the other day by Mr. F. Gale, general manager of the Lydbrook works of Edison Swan Cables, Ltd. Although the cost of labour is about the same as in urban areas, the field for selection is wider. There men normally are relatively poorly paid and eagerly seek the more remunerative employment offered by an industry situated near their homes. They are keen to keep their jobs and thus they achieve a higher standard of efficiency than that to be expected in areas where the inducement is not so obvious.

Grossly Exaggerated

SMOKE has slain its thousands, but we in describing its evil effects recently slew our ten thousands, as a Colombo correspondent points out in a letter published in this issue. Of course, we didn't really mean it when we said that smoke killed an eighth of the population annually, for at that rate it would soon effect its own cure—and ours! We intended to stress the fact that it was responsible for an eighth of the *deaths*, and so our correspondent can now return home with lessened misgivings.



Excellent Modern Lighting in Some London Hotels

1. A bedroom at the Berkeley Hotel. 2. A novel dressing table (Berkeley). 3. Alcove lighting at Claridge's. 4. An illuminated wash-basin at the Savoy. 5 and 6. A private sitting room and a bathroom at Claridge's. 7. One of the Savoy bedrooms. 8 and 9. A sitting room and a bedroom at the Howard Hotel. 10. Another bedroom at the Berkeley. The architects responsible for the design of the fittings were as follows: Berkeley & Savoy, Mr. Howard Robertson; Claridge's, Mr. Oswald P. Milne

Radio Measurements. By N. Wells, M.Sc.

The application of the decibel system

A FEW years ago the decibel or, as it was then known, the "transmission unit," was employed practically solely by line engineers as a convenient system of relative measurements in connection with telephone lines and associated telephone apparatus. With the advent of transoceanic telephony, however, radio transmitters and receivers have become prominently linked with the problems of line telephony, and there is apparent a growing tendency to employ the line engineer's methods when dealing with radio apparatus generally. The article which follows is written mainly from the point of view of the average electrical engineer, who has at times to deal with radio practice, but who is not familiar with the more recent system of measuring the very small quantities of power gains and losses, common to radio reception and the earlier stages of speech amplification in telephone transmission apparatus.

When referring to a telephone landline it is easy to understand the statement that an input power of one microwatt has been reduced, say, to a value of one-tenth of a microwatt at the output, or again, when dealing with an amplifier, that an input of one microwatt has been augmented, say, to make the output ten microwatts, but unfortunately this simple statement does not give the information in a sufficiently useful manner when dealing with power losses along landlines or gains through amplifiers. The loss along one km. of a certain cable for 100 microwatts input might be 10 microwatts, but it would not be 20 microwatts for two km. of cable because the power is already reduced to 90 microwatts at the commencement of the second km.; to put the case another way, it is obviously absurd to expect no power at all at the other end of ten km. of cable.

Cable Loss Ratios

A cable, since its losses are constant, dissipates a certain percentage of the power flowing through each centimetre of its length. But, while the percentage dissipated is constant, the original capital of power (rate at which energy is passed into the cable) suffers diminution over every centimetre of cable length, and therefore the actual amount dissipated diminishes in like proportion.

For example, assume that the loss of power through 10 km. of cable is 90 per cent. of the original input, which gives a ratio of output to input of 1/10; if another ten km. is added the ratio will be $1/10 \times 1/10$, and for a third length of 10 km. the ratio will be $1/10 \times 1/10 \times 1/10$, or $1/10^3$ and so on. Thus the overall loss, expressed as a ratio for ten, twenty, or thirty km. is $1/10^1$; $1/10^2$; $1/10^3$, &c. One must not overlook the fact that, while the loss ratio for ten kilometres is 1/10, the ratio for one kilometre is $1/10^{0.1}$ or 1/1.26; the ratio for two km. is $1/10^{0.2}$ or 1/1.58, and the ratio for three km. is $1/10^{0.3}$ or 1/2 very nearly, and so on, as seen graphically in the lower part of the accompanying curve.

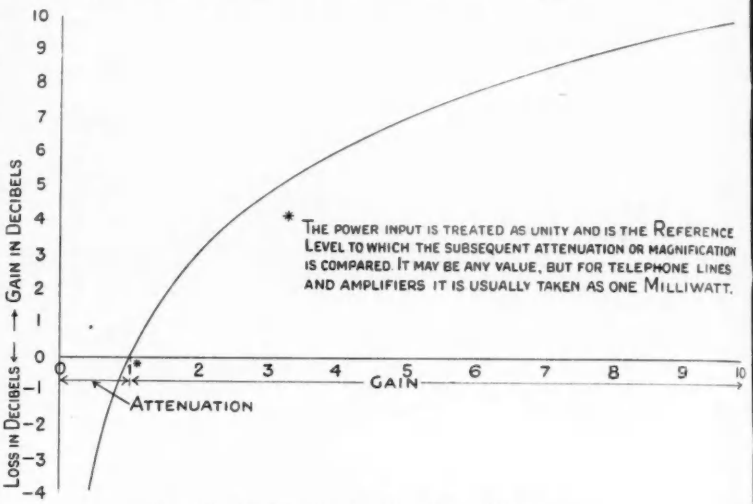
The next step is to write 1/10 in the form 10^{-1}, whence it is clear that the logarithm of 1/10 is (−1.0); similarly, the logarithm of $1/10^{0.1}$ is (−0.1). It is thus apparent that the losses along the cable are in logarithmic ratio; that is to say, that if the log. of the ratio of output to input over one km. is expressed as (−0.1), *i.e.*, log. 1/10, $^{0.1}$ or log. 1/1.26, then the logarithm of the ratio for ten km. is ten times this figure, namely (−1.0), or log. 1/10. Hence, it is convenient to multiply the figures by ten, thus giving whole numbers for the smaller and frequently employed measurements, and to adopt as a standard against which to measure the losses in all classes of cable, a particular cable of such dimensions that the loss along one mile (note) reduces the power in the ratio 1/1.26, or along three miles in the ratio 1/2 very nearly, or along ten miles in the ratio 1/10, &c.

With a view to adopting such a scheme a Standard Specification was drawn up and the loss along any length of cable was always referred to in equivalent miles of "standard" cable. or M.S.C. The actual unit, however, was not exact, and also it suffered from a defect inherent to cables, namely, that attenuation varies with frequency, and therefore it had to be defined in conjunction with a standard frequency.

What the Decibel Is

More recently another unit, the bel, has been universally adopted. This takes the form of an artificial cable built up by a resistance network, which is independent of frequency and through which the attenuation is in the exact ratio of 1/10. In practice one-tenth of the bel, or one decibel, is employed; thus the loss expressed as a ratio through 1 db.= 1/1.26; through 3 db.=1/2 very nearly, and through 10 db.= 1/10.

Since the gain ratio is higher than unity and the loss ratio is less than unity, and since logarithms of figures greater than unity are positive, while logarithms of fractions are negative, the gains are indicated by so many decibels above reference level, plus decibels, and the attenuation by so many decibels below reference level, minus decibels.



A graph showing line losses and amplifier gains

To obtain decibels by calculation we have the simple formula: No. of decibels=10 log. P.1/P.

Note that the decibel refers to a ratio and does not denote any particular quantity of power. But if it is anchored down to some particular value of power input, we have a definite datum level from which increase or decrease can be measured in actual values. *The generally accepted level for line work is one milliwatt.*

Incidentally, it should be pointed out that the noise level of a receiver is sometimes compared with the level at the output of the final rectifier, which may differ appreciably from one milliwatt. This does not interfere with the previous statement; it simply means that other cases require other data.

Filters and Amplifiers

We have referred mainly to losses through a landline but, since line filters impose attenuation on the circuit, it is usual to measure their losses by the same units, *i.e.*, decibels. It was as a measure of losses, or attenuation, that the unit was originally employed but, since in modern line practice we are concerned with amplifiers, which have gains to their account, the same unit has been adopted as a means of measuring the ratio of output to input power. This is a logical change in standards of measurement; also it is consistent with the practice of working an amplifier at constant amplification and varying the output by means of attenuation "pads," which vary the input power or level.

So far we have been concerned with power ratios that are purely relative and, to be perfectly logical, *are independent of the load resistance values of the inputs or outputs* across which a series of measurements is made. But, since power = (amps.)^2 × resistance, or (volts)^2 ÷ resistance, it is permissible to obtain a power ratio by taking the ratio of (volts)^2 or (amps.)^2. Thus db.=10 log. P.1/P=10 log. $V.1^2/V^2$= 20 log. V.1/V.

There is, however, an important difference here: we are now concerned with power ratios as indicated by either voltage or current and it is essential, if one ratio is to be compared with another ratio, that the resistance value be similar at all points across which the power is measured. Moreover, this resistance must be specified if we are to have a datum or reference level.

The reason for adopting voltmeter readings is that in practice it is neither convenient nor yet possible to measure the small amounts of power appropriate to line work by delicate wattmeters; but it is comparatively simple to record small differences of potentials, so that the actual measurements are made by means of a delicate voltmeter, euphemistically termed a "volume indicator," or, sometimes, more rationally a "valve

voltmeter." The voltmeter, then, simply registers the varying values of potential due to various values of power across some common equivalent load resistance.

[For special tests it may be necessary to employ current, as registered by a thermo-ammeter (and through a given resistance), since a voltmeter would not sum all the voltage components of a tone frequency. But this is a fine point and does not concern us here.]

Examples of exterior lighting for hotels: (Left) the Hinchley Wood Hotel, Kingston By-pass Road; (right) the garden of Bourne Hall, Bournemouth

Equivalent Load Resistance

The impedance of a properly terminated line is equivalent to a pure resistance, and in this country the impedance of the usual cable or line employed for telephony is 600 ohms between pairs, as measured at an average voice frequency. Hence it is implied, or actually stated, that the reference level represents an input of one milliwatt into a 600 ohm line, all subsequent comparisons being on the basis of a similar value of impedance.

At the risk of repetition it must be emphasised that "power" is not concerned with the resistance value of the load which absorbs or dissipates it, and can be measured as (volts×current) regardless of such value. But when either voltage or current is measured and employed independently *as an indication of power* it is necessary to refer the measurements to some constant value of resistance. Of course, this is simply an indirect way of bringing in the other component of either current or voltage.

Thus we see that, from an operating point of view, because a voltmeter is the instrument used for measuring power, it is necessary that all line, and all input and output impedances, shall have one common value of resistance impedance. Another aspect is that from the performance point of view it is necessary that all inputs and outputs be matched, to avoid reflection and losses; in other words, to ensure a good power factor.

The Use of the Voltmeter

When making power level measurements there is an important point to remember. If one is simply concerned with the level, say, of a landline that is properly terminated by a matched input transformer, all that is necessary is to plug the voltmeter straight across the line at the particular point where the information is required, and then compare the voltmeter reading with the reading appropriate to one milliwatt. But if one is concerned with the output level of an open line, it is necessary to realise that a voltmeter applied directly to the line terminals would be of no value, since the line would suffer from reflection effects and the volts indicated would be entirely misleading.

For this reason it is usual to incorporate a "terminating resistance" in the voltmeter, of the correct value to match the line impedance, *e.g.*, 600 ohms. This resistance can then be switched across the voltmeter terminals when measuring open line or amplifier outputs, or it can be switched out if the voltmeter is plugged across a line or amplifier output already terminated at the far end. For instance, if the output level of an amplifier is required when it is already connected to a filter, then the voltmeter is plugged straight across the output terminals, whereas if it is a case of measuring the output of the amplifier alone, then either the 600-ohm shunt resistance must be switched in, or the output must be deliberately plugged into some suitable piece of apparatus.

A varying source of sound power produces in the human ear sensations that are in logarithmic ratio to the various values of power. Very roughly the range of levels from a soft whisper to very loud speech is 60 decibels, and the range of average powers used in conversation by the majority of speakers is 21 decibels. A change of the power level of a sound by one decibel is approximately the smallest that a sensitive ear can detect, while the average ear cannot detect a change of less than two decibels.

As a very rough guide the following "noise" table should be studied:—

Db.	Noise.	Power level.
−65	Threshold of hearing	1
−55	Rustle of leaves, or soft whisper	10
−45	Quiet garden	100
−35	Quiet office	1,000
−25	Noisy office	10,000
−15	Quiet automobile	100,000
−5	Ordinary conversation	1,000,000
+5	Loudspeaker	10,000,000
+15	Heavy street traffic	100,000,000
+25	Pneumatic drill	1,000,000,000
+35	Riveting machine	10,000,000,000
+45	Airplane engine	100,000,000,000

The conversion table herewith is of interest, as well as the curve indicating graphically the relations between decibels and power ratios. An example of the relations between decibels, voltage, and power in the case of a short-wave aerial is to assume that it has an effective vertical overall height of 10 metres, that its radiation resistance is 100 ohms, and that the field strength varies between 1 and 100 microvolts per metre. Then for a field strength of 1 microvolt per metre:—

Power in aerial = $(10 \times 1)^2/100 = 1$ microwatt.

While for a field strength of 100 microvolts per metre:—

Power in aerial = $(10 \times 100)^2/100 = 10{,}000$ microwatts.

Thus there is a variation in power equal to 1/10,000, corresponding to a variation in (micro) volts of 1/100, and measured as a change of 40 decibels.

DECIBEL CONVERSION TABLE.

Decibels (plus).	Power ratio.	V. or I. ratio.	Decibels (plus).	Power ratio.	V. or I. ratio.	Decibels (minus).	Power ratio.	V. or I. ratio.
0	1.0	1.0	12	15.8	3.98	0	1.0	1.0
1	1.26	1.12	13	20	4.46	− 1	0.8 app.	0.89 app.
2	1.58	1.26	14	25	5	− 2	0.62 ,,	0.8 ,,
3	2	1.41	15	31.6	5.62	− 3	0.5 ,,	0.7 ,,
4	2.5	1.58	16	39.8	6.3	− 4	0.4 ,,	0.62 ,,
5	3.16	1.78	17	50	7.1	− 5	0.32 ,,	0 56 ,,
6	3.98	2.0	18	63	8.0	− 6	0.25 ,,	0.5 ,,
7	5	2.24	19	79.5	8.95	− 7	0.2 ,,	0.45 ,,
8	6.3	2.51	20	100	10	− 8	0.16 ,,	0.4 ,,
9	7.95	2.82	30	1,000	31.6	− 9	0.12 ,,	0.35 ,,
10	10	3.16	40	10,000	100	−10	0.1 ,,	0.32 ,,
11	12.6	3.55	50	100,000	316			

A List of Standard Specifications

The British Standards Institution has issued its annual report with which is incorporated an indexed list of British Standard Specifications. The report on the activities of the three divisions—Engineering, Building and Chemical—shows the valuable work voluntarily carried out by the Institution's 600 technical committees. Copies may be obtained from the Institution, 28, Victoria Street, S.W.1, price 1s. 2d. post free.

More About the Hoover Dam

By H. E. M. KENSIT, M.E.I.C., M.A.I.E.E.

AN illustrated description of the great power, irrigation and water supply undertaking on the Colorado River between the States of Arizona and Nevada, was given in the ELECTRICAL REVIEW of November 20th, 1931. Since that time great progress has been made.

The natural flow of the river varies from 1,200 to 250,000 cu. ft. per second and flood control is one of the main objects of the undertaking; the construction of the dam will secure a maximum discharge of 75,000 cu. ft. per second and a minimum of 10,000; it will enable 7,000,000 acres to be irrigated, will give a water supply for domestic and general purposes of a thousand million gallons per day, and will supply sufficient water to drive a hydro-electric installation of 1,200,000 h.p. in a single plant which will probably be the first to reach that size. The dam will rise 727 ft. above bed-rock, will raise the level of the water 582 ft., and maintain an average head of 520 ft. The site is in an isolated, arid, and mountainous district, and a complete new town, Boulder City, was built as the first step towards making construction possible.

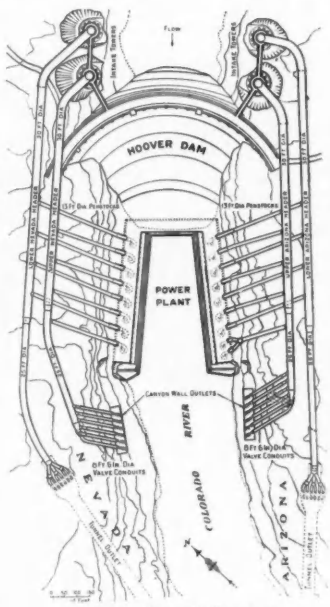
Tunnelling Through Solid Rock

The contract for construction was signed on April 20th, 1931, and ever since the work has been proceeding at high pressure night and day, mainly on the four diversion tunnels; these, bored through solid rock, are each 50 ft. in diameter, about 4,000 ft. long, and concrete lined. They are expected to be completed by October, 1933, and must be in use before the construction of the dam can be commenced. The velocity of the stream is from eight to thirty miles per hour and when in flood is said to rise 60 ft. in six hours and carry some sixty per cent. of sand and gravel. After their use for diversion two of these tunnels will be used as penstocks and two for spillways, and there will also be two 30-ft. penstock tunnels direct from the intake towers.

Piping of unprecedented size and weight is to be used.

What the completed installation will look like

The contract for this was recently let to Messrs. Babcock and Wilcox of New York. The layout is shown in the plan herewith. Some 13,000 ft. of this steel pipe, from 8½ to 30 ft. in diameter and of thickness up to 2¼ in., will be used and will require 55,000 tons of steel. Each length of the largest pipe will require three plates of such weight that only two plates can be shipped on one railway car. As no railroad can handle pipe of this size and weight it will be necessary to construct complete works to fabricate it by the fusion-welding system near the site of the dam. Each piece of pipe so fabricated will be 12 ft. long and two such pieces welded together will form a unit construction section, and will weigh 150 tons. The welding will all be examined with X-rays and it is stated that the amount of film required will exceed the total of that produced to date for all industrial purposes.



General plan of the dam, showing penstocks

The method decided upon for the construction of the dam is unusual. As previously mentioned, its total height will be nearly 730 ft.; it will be 650 ft. thick at the base and the total width on the crest 1,180 ft. On account of the enormous mass of concrete, the dam will be built in vertical blocks 50 ft. square and the joints will be subsequently grouted under pressure. To guard against the heating of the concrete in setting, chilled water will be circulated through it by a complete system of 120 miles of pipes. Power for all the construction work is being brought from California by a 225-mile transmission line.

A Lengthy Aqueduct

The water supply side of the project has some striking features. The whole 1,000 million gallons per day is intended for Southern California, where the local supply is insufficient to meet the growing demand. The aqueduct will be 250 miles long, of which 84 miles will be tunnel, and it must cross the mountain divide where it will need a lift of 1,500 ft. and require some 400,000 h.p., or about one-third of the 1,200,000 h.p. to be installed.

Boulder City has now a population of between 5,000 and 6,000 people and possesses paved streets, sewers, public utilities, churches, theatres, &c. Added, however, to the stupendous physical difficulties of the work at the canyon is the heat under which much of it has to be done. The shade temperature rises to 128 deg. F. and for ninety days in summer the average daily temperature is 120 degrees.

The Production of Copper Sheets

After thirty years of experiments and research, Mr. Sherard Cowper-Coles has evolved a practical process which enables sheets of pure copper of varying degrees of hardness and of any thickness to be produced in one operation direct from copper ingot partially refined. The process is one of electrolytic refining and deposition on a revolving drum. Various attempts made in the past to produce sheets by an electrolytic process have not been commercially successful for a number of reasons, some of the most important being: slowness of deposition; inferiority of the sheet to ordinary rolled sheet; low efficiency of the process; large proportion of scrap metal; an even gauge could not be obtained; considerable floor space required, and lack of uniformity of product.

These difficulties are claimed to be entirely overcome by the Cowper-Coles process, and sheets equal or superior to those obtained by rolling are produced. The process is one of building up, not breaking down, and therefore very thin sheets can be made as cheaply as thick sheets, except for the small extra labour in handling a greater number of sheets per ton. The extras on thin sheets are as much as £10 per ton for each gauge; thin sheets can only be rolled of comparative small sizes, otherwise they cannot be kept in gauge. The new process enables the thinnest sheets to be produced of almost any size, for instance, 12ft. × 4ft., and permits small units to be worked very economically.

Both in hot and cold rolling the amount of scrap is very considerable, varying with the gauge; the thinner the gauge the greater the amount of scrap. In the new process the amount of scrap is said to be reduced to about one per cent., but as it has been refined during the process of deposition it fetches the highest market price. It is claimed for the new process that the copper can be made so hard, without any after treatment, that it can be used for spring contacts in place of phosphor-bronze, whilst retaining the advantage of pure copper with its high electrical conductivity. The process can also be employed for the production of bi-metallic sheets, such as copper sheet faced with tin of any desired thickness, or nickel, suitable for stampings or spinning. Copper sheets produced by the new process have on one side a high mirror finish, which in many industries is a great advantage.

Some Driving Forces in the Industry: Falk, Stadelmann & Co., Ltd.

1. Mr. C. Bailey, manager, Illuminating Glassware Dept. 2. Mr. Geoffrey Falk, manager, Domestic and Industrial Cooking Apparatus and Fire Dept. 3. Mr. Gustav Falk, director and manager, Electric Light and Accessories Dept. 4. Mr. E. Stockwell, manager, Illuminating Engineering Dept. 5. Mr. H. French, manager, Wireless, Lamp and Sign Dept. 6. Mr. A. J. Sudul, commercial manager. 7. Mr. E. Barnard, manager, Electric Light Fittings Dept. 8. Mr. L. Thurner, managing director. 9. Mr. Max Falk, chairman. 10. Mr. W. C. Jeary (*Metatone*), sales manager.

Oxide Film Insulation. By G. Shapiro, A.M.I.E.E.

THE Electrotechnical Research Institute in Moscow is reported to have developed a process* whereby an oxide film can be deposited on aluminium wire to withstand several hundred volts. This oxide film possesses good insulating, heat-resisting, and heat-conducting properties; it is flexible, mechanically strong, and capable of withstanding shocks and friction. In the event of a local puncture, the heating by the spark will produce an intensive oxidation of the bare metal, which will then again be covered with an insulating film.

The extreme thinness of the oxide film, its good heat conductivity, and the large surface in contact with air create exceedingly favourable conditions for cooling, which taken in conjunction with the very high heat resistance of the oxide film (whose melting point is 2,500 deg. C.) make possible a very considerable increase of the permissible current density. Moisture, chemical reagents, and corona do not affect it; it is also very hard and is not subject to ageing.

Method of Deposition

For depositing the film the aluminium is treated with oxidising chemicals at high temperature. The chemical action of the oxidising solution can be increased by an electrolytic process, which in its simplest form consists in anodic polarisation of aluminium in a suitable electrolytic bath; the oxygen separating during the electrolysis produces the required action.

An oxide film can be obtained in any weak acid solution and in many weak alkalis. Organic acids produce the best results; good results are obtained also with chromic, oxalic and boracic acids, and with soda and borax. To obtain a sufficiently thick formation the film on the aluminium anode must be disturbed from time to time by imposing an alternating current on the direct current.

A semi-industrial plant has been established at the Institute for the production of oxide insulated aluminium wire. The first 10,000 metres produced were employed for winding a 20-kW 6,600/550-V transformer to be used for studying the behaviour of this insulation under working conditions. The puncture voltage was 300 V and the insulation was not broken when the wire was wound round a cylinder with a diameter thirty times that of the wire.

Higher Working Temperature

The stator of a standard three-phase induction motor was also wound with this wire with promising results.† For the standard motor the copper space factor in the stator is 0.35, whereas for oxide-film insulated conductors it is 0.57, *i.e.*, an increase in the ratio of 1.6 to 1. For the same resistance the cross sections of aluminium and copper conductors should be in the ratio of 1.66 to 1; thus compensation for the lower conductivity of aluminium has been nearly obtained by the better utilisation of the available room in the iron.

These tests have also shown that the high thermal resistance and high heat conductivity of the oxide film insulation make it possible to increase considerably the temperature rise of the windings. During the tests the experimental motor was run at a total temperature of 175 deg. C. (instead of the permissible 95 deg. C. maximum), without injurious effects; this suggests a way of increasing outputs without increasing dimensions and weights of machines. The increase of output is, however, accompanied by decrease of efficiency.

The Institute has deposited oxide films on ribbons and small plates; with the latter a puncture voltage of 5,000 V has been reached. Experimental work is proceeding for the purpose of improving the quality of this insulation (especially as regards flexibility) so as to enable its use in windings placed in slots. An oxide film has also been deposited on copper conductors, preliminarily covered with a " stocking " of aluminium.

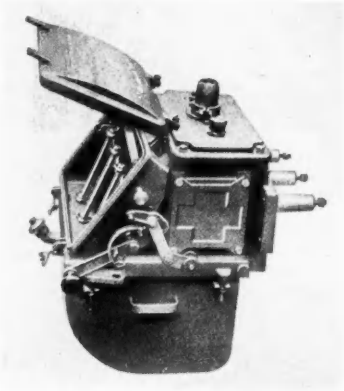
Oxide film insulation offers great possibilities for apparatus subject to heavy overloads, and with short-time ratings or as insulation between turns of turbo-alternator rotors or between commutator bars. At present it is still in the experimental stage and further research is essential.

* " Technika," No. 44, 1932. † " Technika," No. 70, 1932.

Oil Switch-fuse Developments

Rotary equipment for 33 kV, and a special spring-loaded "element"

IT will be recalled that about a couple of years ago Messrs. Long & Crawford, Ltd., 2, Gorton Road, West Gorton, Manchester, designed and introduced their rotary switch-fuse to meet the demand for an inexpensive unit suitable for controlling from the h.p. side small power transformers. The switch-fuse can be mounted directly on the transformer tank, thus eliminating cable boxes and interconnecting lengths of cable.



A 12-kV, t.p. "rotary" switch-fuse

The chief feature of the design, however, is that which overcomes the objections of lowering the oil tank for fuse replacement, an operation presenting great difficulty during bad weather. The framework on which the fuses are mounted is given a rotary motion instead of the usual vertical motion. The action of throwing the switch handle from the "on" to the "off" position brings the insulated carriage on which the fuses are mounted out of the oil tank in which the fixed contacts are immersed into a chamber immediately above the oil tank, where access to the fuses can be readily obtained on lifting a self-supporting hinged lid. In this "out" position the fuses are isolated completely from both the incoming and outgoing terminals, either or both of which may be alive, and accidental contact with live metal is guarded against by an earthed metal shutter which automatically seals off the oil tank from the fuse inspection chamber on raising the inspection lid.

In a cable sealing chamber the incoming cable is directly connected to the switch terminals. It has been found, however, that a unit of this type can have many other applications, such as controlling tee-off overhead lines and sectionalising, thus leading to the introduction of various types of terminal arrangements.

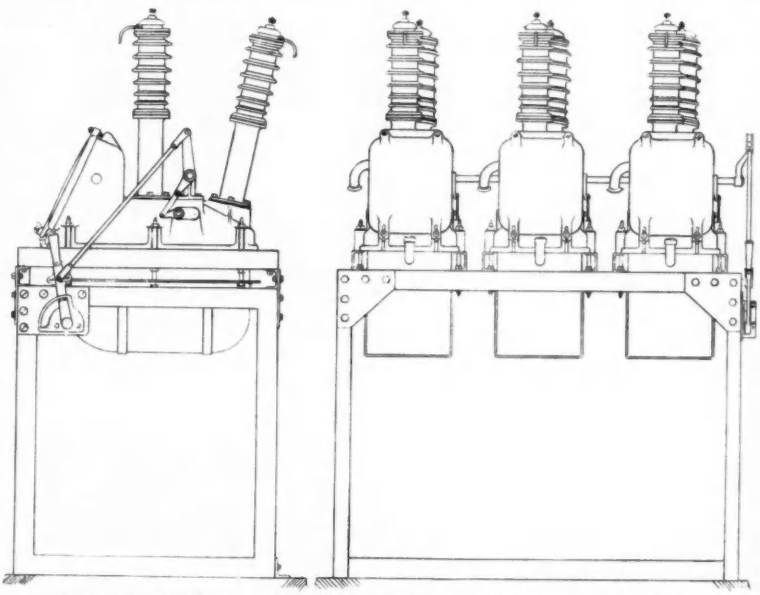
Higher Pressures Provided For

The equipment as described is suitable for pressures up to and including 12 kV, but now, to meet a new demand, it has been developed for use on 22- and 33-kV systems. The rotary principle is retained, but instead of a triple-pole unit, single-phase units mounted on a common framework are provided. The self-contained sealing chamber incorporated in the smaller unit is abandoned, outdoor type bushings being substituted. These bushings are either of the oil-filled or condenser patterns, although single-core cable-sealing boxes can be substituted.

Although the size of this 33-kV unit precludes its direct attachment to power transformers, connection to such equipment is provided for by oil-filled troughs, special arrangements being made to take care of oil expansion and to ensure correct oil level.

A New Type of Fuse

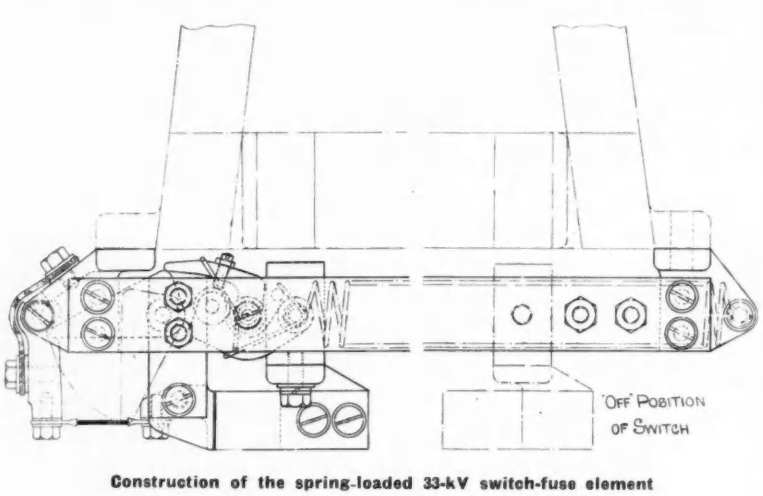
One of the chief difficulties in the design of fusible elements for small currents is that fuse wires of small gauge are necessary, especially as the cooling effect of the oil has to be taken into consideration. The length of the fusible element is also of importance as the amount of volatilisable metal should be as small as possible. But it is necessary to separate the terminals holding the fuse wire as quickly as possible after opening the circuit on overload or short-circuit conditions. This has been accomplished in the past by spring loading the fuse at either one or both ends, but owing to the strain imposed on the fuse wire such a device could not be used for small currents. The pull on the fuse wire has been reduced in many ways, but Messrs. Long & Crawford set out to design a fuse which, whilst containing a very small amount of fusible metal, would incorporate the advantages of spring loading without the disadvantage of the spring exerting force on the fuse wire. These conditions have been fully met by providing a fusible element having a quick-break switch in series with it.



Arrangement of s.p. units for a three-phase 33-kV "rotary" switch-fuse

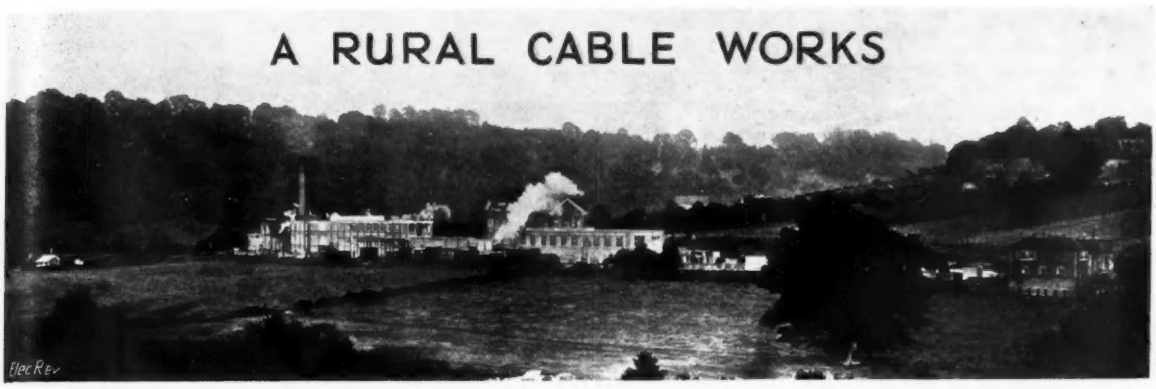
The action of this switch-fuse "element" depends absolutely upon the rupture of the fuse wire. One end of the fusible element is supported by a pivoted dependable arm which also supports at its upper end a spring-loaded lever. On rupture of the fuse the pivoted dependable arm moves slightly, causing the spring loaded lever to liberate the switch instantly. The result is, therefore, that the switch-fuse has two breaks in series, the fusible element and the switch. The stored energy in the spring can be utilised for the purpose of opening all three phases on the rupture of a fuse in any phase in such a manner that the remaining spring-loaded switches are released without rupturing the associated fuses.

We handled a preliminary demonstration model of this switch-fuse unit in the Long & Crawford Works, and the ease of operation of both the dependable arm and the switch was most striking. The length of the fuse wire is only about one inch.



Construction of the spring-loaded 33-kV switch-fuse element

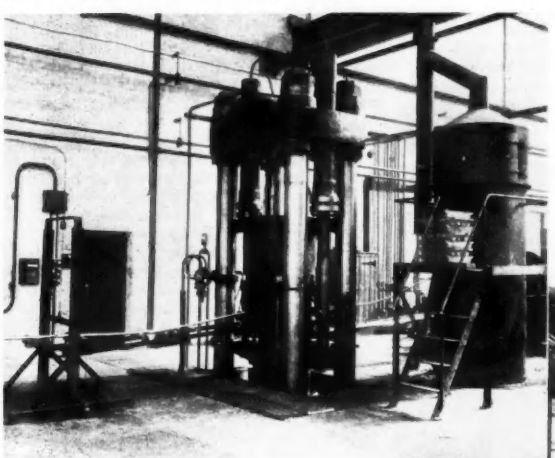
A RURAL CABLE WORKS



THERE is a sound utilitarian idea behind the erection of a cable works in so delightful a spot as Lydbrook, Gloucestershire, which is only about one and a half miles from the famous Symonds Yat, as a clean atmosphere is most desirable for the manufacturing processes. Edison Swan Cables, Ltd., may be said to have prevented, potentially, the spoiling of the scenery, as they have purchased about 180 acres of adjoining land to prevent the erection of cement works in the vicinity of their own pleasingly designed buildings.

The present factory, which is laid out for the manufacture of paper, rubber, and bitumen-insulated cable, copper and aluminium overhead lines, and transformer strip, occupies about six acres. The works are served by a private siding from the G.W.R., of which it is the only big local customer. Coal is obtained from the Forest of Dean a few miles away, and water from the Wye is stored in a 100,000-gal. reservoir.

Electricity to the extent of nearly 1½ million kWh per annum (500 kW of m.d.) is taken from the overhead lines of the S.W. & S. Power Co. and transformed to 400 V in an outdoor sub-station. The power factor reaches about 90 per cent., due to the use of condensers. An emergency system of pilot lighting is supplied from a 110-V battery.



A lead press in the paper cable factory

During a recent visit to Lydbrook we were afforded an opportunity of seeing the methods of production from start to finish. High-conductivity copper rod is used exclusively. The hard scale of black copper oxide is first removed by pickling in dilute sulphuric acid, and after cleaning is drawn through as many as twelve dies (depending upon the size required) on high-speed continuous wire-drawing machines. The dies, which are immersed in a lubricant, are made of chilled iron, tungsten alloy, or diamond—the last being used for wires of 0.064 in. diameter and less.

Rubber-covered Cables

The hard-drawn wire thus produced is used chiefly for overhead lines where high tensile strength with minimum elongation is required, but for general use, in the manufacture of cable the wire is annealed in an air-tight water-sealed muffle, through which it travels on an endless chain. The annealing temperature is controlled by an electric pyrometer.

The copper for rubber-insulated cables is passed through an electrically heated bath of molten tin. The rubber has a fine hard Para basis and is prepared by a range of washing, mixing and calendering machines.

The tinned conductor, of single and stranded wires, is first covered with a layer of pure rubber and then with two or more layers of compound rubber, either on longitudinal-covering or lapping machines, after which it is lapped with rubber-proofed tape. The subsequent vulcanising process consists in subjecting the cables to live steam at from 40 to 45 lb. per sq. in. for periods depending upon the thickness and quality of the rubber.

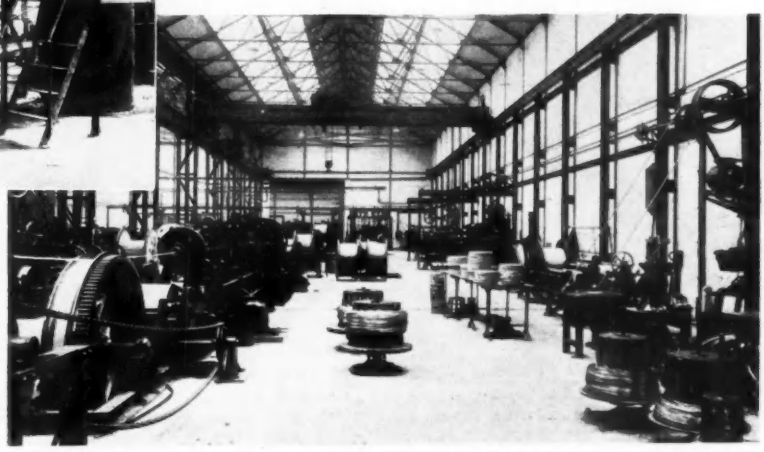
An Electrically Heated Press

Before receiving protective coverings, the cables, after being immersed in water for twenty-four hours, are electrically tested in accordance with British Standard or other required specifications. The coverings usually consist of a braiding of cotton, jute, or hemp yarns, saturated with a preserving compound, or seamless lead tubing applied by an electrically heated lead press.

For trailing cables subject to rough usage, *e.g.*, in mines, special coverings of c.t.s. or whipcord braiding are applied, and for the abnormal conditions of chemical works, boiler houses, drying rooms, &c., "Virite," a special rubber compound, has been evolved. This is put on by the extrusion process and can be lead covered, braided, or provided with any other special form of mechanical protection.

Modern vulcanised bitumen cable is not liable to the troubles from decentralisation or explosion that make one anxious about the old d.c. systems where single-core v.b. cables are laid solid. The compound manufactured in the Lydbrook rubber mills is applied as an extruded solid tube to the tinned copper of the individual cores, which are laid up together round a central bitumen core and sheathed overall with bitumen compound.

Over the tapes and yarn coverings are laid two layers of galvanised steel wire wound in opposite directions which form both a mechanical protection and an earth in case of faults.



One of the end bays of the paper cable factory

The conductors for p.i. l.c. cable are generally of annealed copper, which is wound on to bobbins on an automatic machine and then stranded on single machines, or for the larger strands on triple machines capable of stranding up to thirty-seven wires and lapping with paper in one operation. The stranded wire is next insulated with plain paper in the form of strip, the number of strips varying with the dielectric thickness required; each layer is arranged to break joint with the one immediately beneath. Jute yarn is used for filling the interstices between the cores, which are further insulated with paper layers to the required thickness.

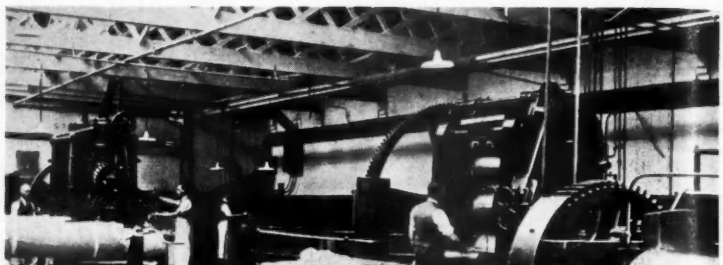
The cable is freed from 75 per cent. of its moisture in an air oven operated at 250 deg. F., the last traces being removed in a vacuum tank, where hot insulating compound is afterwards forced into the paper. The lead sheath is applied in presses, with electrically heated die boxes. After immersion in water for twenty-four hours the cable is pressure tested by a 50-kVA Met.-Vick. equipment which converts the three-phase supply to single-phase 50-cycle a.c. with a true sine wave form.

The engineering shop is well equipped for turning out the special machines used in cable manufacture. The laboratory also struck us as being well up to the high standard of the rest of the works. The canteen, which is capable of providing about 200 meals at once, is, of course, electrical, the apparatus having been supplied by associated companies.

The most spectacular machine in the shops seemed to us to be a stranding machine which is capable of dealing with 7/19/37 wires in one operation, but this is run close by the large laying-up machines for 0.5 sq. in. 7-core and 4-core cables. We also noticed that, generally, where careful attention to oiling is essential, the oil-holes are marked out in red.

The cleanliness of the bitumen shop was remarkable; this is brought about by the installation of cowls over each machine connected to an omnibus main pipe which is exhausted to atmosphere by a 36-in. fan.

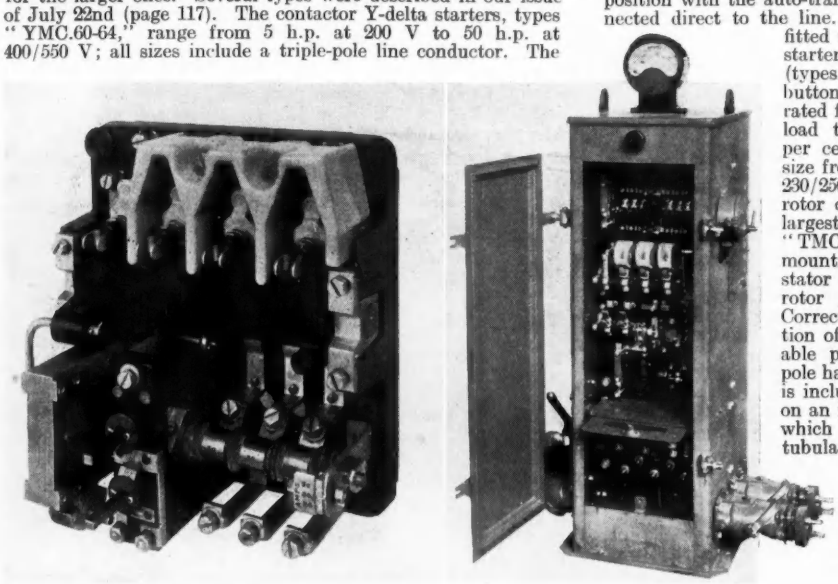
Electricity is a conspicuous feature in auxiliary operations; thus a two-ton Ransome-Lister truck is used for interdepartmental haulage, and electric welding is largely used, *e.g.*, for jointing the lengths of steel-tape armouring. Among the more striking work carried out by the company are an Admiralty gun-control cable comprising 122 wires in 28 cores, and, at the other extreme, a 600-V single-core rubber-insulated cable with a cross-sectional area of 1.25 sq. in. for the Metropolitan Railway.



In the rubber mill, showing calenders, and mixing and washing machines

New B.T.-H. Motor Control Gear

RECENTLY the range of a.c. contactor starters made by the British Thomson-Houston Co., Ltd., has been considerably extended, whilst at the same time improvements have been effected in many other starters, which are now more compact, lighter, and cheaper than formerly. Wall mounting cases are standard for small starters and floor mounted pillars for the larger ones. Several types were described in our issue of July 22nd (page 117). The contactor Y-delta starters, types "YMC.60-64," range from 5 h.p. at 200 V to 50 h.p. at 400/550 V; all sizes include a triple-pole line conductor. The two smaller sizes are supplied as wall mounting panels for separate push-button control only. The three largest sizes are suitable for separate push-button or pilot-switch control, and may be supplied as wall mounting panels or floor mounting pillars with isolator. The pillars are of sheet-steel with hinged cast-iron or glazed doors. The Y-delta contactors are so interlocked mechanically that if one is closed the other is open. The latched-pattern thermal over-current relays are in circuit in both starting and running positions.



Left: Starter unit as supplied for building into customer's own enclosure. Right: Type TMC 903 starter with 40 h.p. induction motors

The contactor auto-transformer starters, types "KMC. 70-73," are of the air-break air-cooled type. The two smaller sizes are supplied for wall or floor mounting, but the two larger ("KMC. 72 and 73") as floor mounting pillars only. The sheet-steel pillars have hinged cast-iron or glazed doors.

Operation is by standard "start" and "stop" push-buttons or pilot-switch control. The starters range from 5 h.p. to 100 h.p. at 400/440 V, and are designed for intermittent duty (not more than five starts per hour) and for frequent duty (not exceeding forty starts per hour). All starters include one or more pendulum timing relays to provide the time delay between switching on to the "start" position (*i.e.*, with transformer taps connected) and switching over to the "running" position with the auto-transformer cut out and the motor connected direct to the line. Thermal over-current relays are fitted to all sizes. The range of contactor starters for slip-ring induction motors (types "TMC. 900-909") are for push-button or pilot switch control, and are rated for forty starts per hour against full-load torque, or alternatively against 60 per cent. full-load torque, and range in size from 2.5 h.p. at 200/550 V to 125 h.p. 230/250 V and 150 h.p. 346/550 V with rotor current not exceeding 225 A in the largest sizes. The smallest starter, type "TMC. 900," is normally supplied for wall mounting, and consists of a triple-pole stator contactor which also carries two rotor points, operated by one solenoid. Correct switching sequence and acceleration of the motor is secured by an adjustable pendulum timing device. A triple-pole hand re-set thermal over-current relay is included. All components are mounted on an insulated base (ebony "Sindanyo") which carries on the back the necessary tubular starting resistances which are included in the equipment.

The types "TMC. 901, 902 and 903" starters are supplied in a sheet-steel wall mounting case with louvred sides, or pillar enclosure. The stator and rotor contactors, single-pole thermal over-current relays of the latched pattern and other components are mounted on a base of selected slate carrying at the back the necessary tubular starting resistances. This group carries the range up to 40 h.p., 346/550 V with a maximum current rotor of 70 A.

The larger sizes (types "TMC. 904-909") are built only in floor-mounting sheet-steel pillars with hinged front doors of cast-iron, and removable sheet-steel back. Alternatively, glazed doors can be substituted for the solid doors without extra charge. The contactors and other components are mounted on a slate base with B.T.-H. unbreakable rustless grid resistances mounted at the back.

The type "TMC. 904" pillar is furnished with single-pole thermal over-current relays; the remainder, types "TMC. 905-909," have magnetic over-current relays, and carry this range of self-contained starters up to 115 h.p. at 200 V and 150 h.p. at 346/550 V; the maximum rotor current of this range is 225 A.

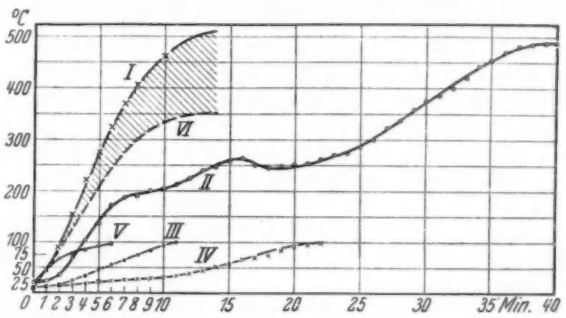
Electric Hot-plate Performance

A RECENT article in the *Elektrotechnische Zeitschrift* contains data comparing the performance of electric hot-plates with that of a coal range.

Three electric hot-plates are considered, of about 5¾, 7⅛ and 8¾ in. dia., rated respectively at 800, 1,200 and 1,800 W. The heating surfaces of the three plates are 25.6, 38.8 and 59.0 sq. in., making a total of about 123 sq. in. The two heating elements of the smallest plate actually consumed 265 Wh and 635 Wh respectively; with both in use (900 W) a maximum temperature of 510 deg. C. was reached in 14 min., as shown by curve I in the accompanying diagram. The energy consumption during this period was 210 Wh. The corresponding figures for the two larger plates were 295 Wh and 450 Wh, making a total of 935 Wh which, at 8 pfennig (0.94d.) per kWh, costs about 0.88d.

These figures are compared with the performance of a coal range which, with a heating surface of 340 sq. in., burns 0.55 lb. of wood and 3.97 lb. of briquettes, at a cost of 0.79d., in attaining a temperature of 485 deg. C. after 40 min. (curve II). Whereas the form of curve II depends largely on the fuel and on the skill of the user, the heating curve of an electric hot-plate is always the same so long as the voltage is constant. The adverse effect of low voltage (percentage not stated) is illustrated by curve VI.

The final temperature of 485 deg. C. attained by the coal range in 40 min. is reached in 11 min. by the electric hot-plate. The effects of this more rapid heating (the present comparison is, of course, from cold in each instance) is shown by curves III and IV. A vessel containing 1 litre (about 1¾ pints) of water at 12 deg. C. is brought to boiling point in 11 min. by the 7⅛-in. hot-plate (curve III) at an energy cost of 0.217d., whereas the coal range takes 22 min. (curve IV) to boil the water and by using the range we are necessarily committed to the minimum expenditure of 0.79d. for fuel as above. Whether the heat developed by the coal range is used or not, about 27,000 B.Th.U. is needed to bring the surface of 340 sq. in. up to working temperature, whereas 3,196 B.Th.U. brings 123 sq. in. of electric hot-plate surface up to full heat. In other words, the coal range absorbs nearly nine times the heat for less than three times the surface; the heating surface of the coal range absorbs nearly 80 B.Th.U. per sq. in. compared with 26 B.Th.U. in the case of the electric hot-plate. Curve V shows



Heating curves for electric hot-plates and a coal range

that the heat stored in the 7⅛-in. hot-plate, when fully heated, is sufficient to boil ¼ litre (½ pint) of water in 6 min.

As regards the performance of the electric hot-plate in continuous service, it is incorrect to base deductions on the fact that 1 lb. of good coal delivers 13,000-14,000 B.Th.U., whereas 1 kWh is equivalent only to 3,412 B.Th.U., or about ¼ lb. of coal. Allowance must be made for the efficiency with which the heat can be utilised and, whereas only 50 to 60 per cent. (often less) of the heat in coal is utilised by coal-fired ranges, the efficiency of electric heating is practically 100 per cent.

Some New Lighting Fittings

ADDITIONS to the number of lighting fittings obtainable in this country are becoming so numerous that it is difficult to keep pace with them.

The General Electric Co., Ltd., has recently introduced several new entirely British-made fittings. Totally enclosed units are available in various shapes: the "Marronne" 12-in. model for 100-W lamps costs 19s. 6d., the "Lochniel" of similar design is available at £1 8s. 6d., while the "Heliopsis" type, which we illustrate, costs £1 11s. 6d. The last two models have hexagonal cast bronze colour galleries, and in all cases special attention has been paid to ensure that only the minimum of light is absorbed by the glass. The "Roslina," a 12-in. model, is available in both bronze (£1 1s.) or chromium plated finishes (£1 4s.).

A number of new switchplates has also been introduced, while the old types F.4161, F.4163 and F.4165 are now obtainable in oxidised silver finish. Type F.4177 switchplate is a new introduction at 2s. 9d. a dozen (3 in. by 3 in.). It is of unorthodox finish—corrugated, oxidised silver. "Bakelite" single hole switch plates are now on the market at 5s. a dozen.

a new type of "Striplite" reflector (F.4431) is loaded at 30 W with an overall length of 1 ft. The reflector is much longer on one side of the lamp than the other in order to project the greatest amount of light upwards or downwards, according to the position of the light. The price is 7s. 6d. Clamps are available at 2s. each for clipping the "Striplites" to glass or at 1s. each for use with wooden shelves.

The "Striplite" model F.4431

The "Gecoray" shop-window reflectors have been redesigned to give better ventilation, and it is claimed to be impossible for the silvering to peel. The popular model (F.5601) costs 21s., but others are obtainable from 15s. to 78s. 6d., all with a five years' guarantee. Another redesigned line are the "Gecoray" shop-window floodlights and spotlights at 32s. 6d. (model F.5633) and 47s. 6d.

"Gecoray" shop window reflector (F.5601), spotlight (F.5643), and "Heliopsis" fitting

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

How the Inland Telegraph Service Works

SOME idea of the measures now being taken to modernise, popularise, and speed up the Inland Telegraph Service is imparted by the paper which Mr. R. P. Smith read at the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 17th.

The author describes how numerous instruments and machinery new to the service have been introduced with unpredecented rapidity. Teleprinters, typewriters, copper-oxide rectifiers, rotary convertors, thermionic valves, voice-frequency signalling and band conveyors are the main features of the reorganised system. Panel-mounted apparatus is a novel departure that has created considerable interest among telegraph engineers. In the circumstances it may be some time before technical literature giving a comprehensive account of the methods employed is available; the paper, therefore, describes the standard equipment in detail. A new class of technical officers for testing and maintenance duties has been created; the personnel is chosen from the general body of telegraph operators and receives training in an engineering school.

The Teleprinter System

A telegraph exchange service, the "Telex," has been made available to subscribers to the telephone service, for whom the necessary apparatus is installed on rental terms. The renters are able to transmit and receive printed communications in addition to the usual telephone facilities. They may also transmit messages to the Post Office, creating a new class of traffic designated "printergrams." The supply of underground conductors is now more than adequate for the requirements of the public services, and channels of communication are offered to the public, on rental terms, for the purpose of private-wire circuits. The ascertained results of the reorganisation, still far from complete, are in the direction of increased stability and accuracy. In addition, recent figures show an improvement in the financial position. In another direction there is evidence that the changes have not been entirely unfruitful as regards increased comfort and convenience of the very large staff.

The Importance of the Service

Despite the welcome growth of the telephone habit, the proportion of telephone subscribers to the total population is still small. The number of telephone stations in use on the Post Office system now exceeds two millions, whilst the estimated population of Great Britain is forty-five millions. A striking instance of the ability of the telegraph service to meet the strain of an emergency occurred immediately prior to the railway strike in 1919. On September 29th of that year the Central Telegraph Office dealt with a record total of 355,353 telegrams. Similar conditions, over a longer period, obtained upon the outbreak of war in 1914. Such circumstances as these justify the maintenance of a telegraph service with equipment in excess of the normal requirement. It provides a second line of defence against dangerous delay and chaos at any time of national upheaval.

Although telegraph traffic is diminishing, in the year 1931 the Post Office dealt with a total of 37.6 million inland telegrams and maintained 6,500 sets of signalling apparatus for the public service. There are 11,400 telegraph offices in Great Britain and Northern Ireland. In the Central Telegraph Office the total indoor staff of all grades numbers 3,860, and 700 circuits are installed. Some idea of the size of this office may be gathered from the accompanying illustration, which shows a small portion of one of the five floors.

A view of the Central Telegraph Office, London

In the Central Telegraph Office the average number of inland telegraph transactions during the busy season (June) is 161,518 daily. The number during the slack season (January) is 114,000, a drop of approximately 28 per cent. The average load during the peak hour (11 a.m. to noon) in the former case is 21,368, and the average load during the hours 8 a.m. to 8 p.m. is 154,508. On one occasion 89,000 telegrams were tendered in one batch at this office. Such an occurrence of course completely upsets the law of averages and staff provision. It will be realised, therefore, that a great deal of telegraph equipment is not employed to its full capacity and that, for general purposes, flexibility of apparatus in relation to fluctuations of traffic is a matter of great importance.

False Economy in Line Insulators

INSULATOR cracking or depreciation can involve a loss of several thousands of pounds on a large system in two or three years, according to Mr. R. C. Andersen, M.C., A.M.I.E.E., in a paper on "Insulator Reliability in Service," which he read recently before the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION.

Cracking is due to faulty insulator technique that completely or partially disregards thermal stressing in service. Furthermore, this disregard, generally, is fostered by specifications devised to ensure high electrical, electro-mechanical and purely mechanical characteristics in a test room. The drafting of these specifications is inspired by the fallacious belief that a good test insulator must be a reliable insulator in service. Resiliency of assembly is absolutely vital, but it must be borne in mind that this resiliency, while it results in insulator longevity, militates against high electro-mechanical test figures. Thermal stressing is responsible for some 90 per cent. of insulator failures, so that reliability in service can only be assured by those insulator shapes and assemblies which have been designed and manufactured effectively to counteract the dire effects of this thermal stressing.

The outlay on insulators in a complete scheme represents only a very small proportion of the total cost, and the slightly increased expenditure involved in obtaining insulator refinements is sound economics.

The Chairman, Mr. J. R. Cowie, referring to the author's comments on the thermal characteristics, said that it was the old story of cutting down the lb. per sq. in., whether it was mechanical pressure caused by temperature or due to electrostatic pressure. The vital part of the author's design, from both the electric stress and coefficient of expansion points of view, lay in the manner in which he handled his area and his cushion medium.

Mr. J. F. Shipley pointed out that the smaller the installation the greater was the risk involved. In a certain small system shutting down would result in a direct loss of £150 per hour and an indirect loss of probably £2,000 per hour.

In torrid climates the surfaces of the insulators were usually very hot, say, 150 deg. F., and in a storm they could be cooled suddenly by hail and water at zero temperature. It was under those conditions that most insulator failures occurred. He had cured troubles on his system by dispensing with cement and with joints in the porcelain. In one installation, which was started about seven years ago, there had been forty or fifty breakages per day during the first three months of operation, due chiefly to lightning. Those responsible had concluded that the troubles were due entirely to the small distance between the line, *i.e.*, the conductor and the top of the pin. Therefore, the whole line was re-equipped with solid insulators and since there had been only two broken insulators per year.

Dr. N. A. Allen said that faults which were inherent in insulators tended to become very much emphasised when oil was present, particularly under slight pressure. A 66,000-V bushing, which was filled with oil, had passed all the specified tests in the factory; there was nothing particularly unorthodox in its design, but it had contained a thin oil, under a pressure of about 10 lb. per sq. in. A breakdown had occurred, and subsequent examination of the porcelain had shown that moisture had entered, probably through the porcelain itself. Further investigation had shown that the inside surface of the porcelain was marked with a series of irregular or interrupted lines, extending from the top to the bottom of the insulator, which was about 30 in. long.

Mr. J. W. Perkins said that his experience in connection with transformer insulators was that such failures as did occur were purely mechanical failures, due, mostly, to breakages in transit. Electrical failures of transformer insulators were very rare.

Mr. Andersen, replying to the discussion, said that if overhead-line engineers would consider the design of their lines from the point of view of mechanical and electrical pressure they would get a much clearer idea of the problem. It was a great mistake to consider an insulator entirely from the electrical point of view and to ignore the mechanical issues.

A very important matter which was often lost sight of when designing a system was that of co-ordinating the line insulators, switch insulators, and bushings.

He thought cement was the only material to use for the purpose to which it was put in insulators. He gathered that the single-piece insulators to which Mr. Shipley had referred were more or less medium-voltage insulators. (Mr. Shipley agreed that they could not be used at more than 33 kVA.) For higher voltage insulators it was necessary to use a medium for joining the metal and the porcelain together.

Discussing variations of temperature, he said that Mr. Valandar had registered differences of temperature of 100 deg. C. within the insulator body in the salt area of Sweden; with a change of 60 deg. C.—which was within his own experience—there would be a stress of about 800 lb. per sq. in. on the porcelain.

The moisture referred to by Dr. Allen might have got through the assembly of the cap and pin. The appearance of the irregular lines on the porcelain was very common. When there was oil inside the bushing, in contact with the porcelain, there was an oil envelope on the porcelain, and an arc could not get away.

The Mining Electrical Engineer's Prospects

IN the course of his address as president of the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS Mr. H. H. Spencer briefly considered the future of the electrical engineer engaged in the mining industry. Although 42 per cent. of the insured workers in the coal industry were temporarily unemployed, and although coal was being produced on four days per week only, and at the end of June was being sold at an average loss of 2d. per ton, Mr. Spencer believed that there were signs of a recovery in world conditions, from which the coal industry would be one of the first to benefit.

Much encouragement was to be derived from the formation of the Coal Utilisation Council to secure the scientific marketing of coal. The chief development in the future would probably be in the production of fuel which could be used in the internal combustion engine or burned in a liquid or semi-liquid state in furnaces for supplying steam to turbines. He instanced the experimental use of colloidal fuel, *i.e.*, a mixture of oil and powdered fuel, by the Cunard Steamship Co., the running of buses on tar-oil, and the work being done on the hydrogenation of coal.

These developments would add greatly to the responsibilities of the mining electrical engineer. Even in the present depression the use of electricity in coal mines was increasing. The h.p. of motors installed rose by 17,000 in 1931, and there was 214,000 h.p. more in use than in 1926, although the number of mines at work had decreased by 168.

Electricity Means Greater Safety

The decrease in the number of accidents due to electricity below ground definitely indicated that electricity was being made safer. The constant search for greater efficiency in getting and handling coal, and the probable installation of larger and more varied by-product plants, all tended to add to electrical machinery in and about collieries.

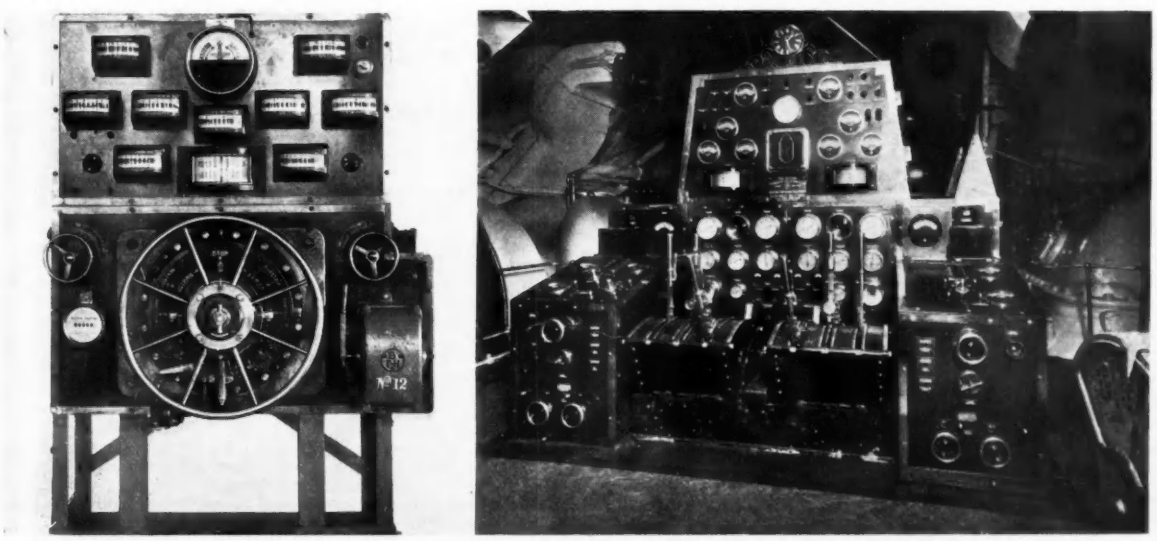
Every effort should be made to improve the status of the mining electrical engineer and to secure greater recognition for his services. Preference should be given by mining companies both at home and overseas to those holding the Association's certificates. The main object of the Association to raise the status of those engaged in the application of electricity to mines could be carried out only if the younger members considered the opportunities which awaited them overseas and took the Association examination in the knowledge that the acquisition of its certificate would stand them in good stead when seeking appointments. This should also assist in attracting the right type of man to the profession, a point of the greatest importance to the industry generally.

Considerations in Electric Ship Propulsion

IN a paper read before the RUGBY ENGINEERING SOCIETY on "Electric Ship Propulsion and Control," Mr. G. O. Watson said that turbo-electric equipments are almost all a.c. schemes in which the main turbo-alternator supplies energy to the propulsion motor only. With the induction-motor drive reversal is accomplished by changing over two of the stator connections, and switching is carried out at from one-fifth to quarter speed. As the h.p. varies approximately as the cube of the speed the power wasted in rotor resistances (usually of monel metal) at quarter speed is only about 2 per cent. of the total. Change-pole motors are sometimes employed to give an efficient cruising speed.

Synchronous Motor Drives

When a synchronous motor is used, reversal is obtained by stator contactors, which can be operated only when the field current of the alternator and of the motor is switched off. The salient-pole motor has a high-resistance s.c. starting winding embedded in the rotor pole faces. When starting, an alternator field of twice the normal is switched on at quarter speed, but the motor field is not closed until nearly



Left: Hand-wheel control in the *San Benito*, one of the earliest ships to be equipped with British electric propelling gear (B.T.-H). Right: The main control gear and instrument panels in the T.S.S. *Strathnaver*.

synchronous speed has been reached, when the alternator field is reduced to normal.

The propeller speed is controlled by the frequency, which is varied by a long-range turbine governor. The stoppage of propellers in narrow waters may cause loss of steering way, and failure to reverse may be equally serious. The B.T.-H. Co. has developed a system which enables a change from electrical to manual control to be instantaneously made; the system also avoid losses in the operating solenoids, which may take two or three kW. Ammeters and voltmeters must be spring controlled; the horizontal edgewise pattern is unreliable, and pivots should be horizontal. A stability indicator, to show whether the system is over or under excited, consists of a voltmeter element, and an ammeter element mounted on the same spindle and working in opposition.

The power supply must not be interrupted unless it is absolutely necessary, and the motor becomes a generator if the ship is travelling at speed and the power is cut off. For protection the neutral of the alternator is earthed through a resistance, a relay, and a circuit-breaker. The last is tripped when an earth fault occurs, thus breaking the earth connection without interrupting the supply, and an alarm is given. If a short circuit, an open circuit or a second earth should develop, balanced protective gear breaks the field of both alternator and motor.

Heavy-oil Engine Equipments

For Diesel-electric propulsion d.c. equipments are the rule; of these there are about 200, averaging 800 s.h.p. each. A multi-engine installation with generators in series provides the most efficient arrangement. The propeller load varies as the cube of the speed, and below full speed the motor field must be strengthened or the voltage reduced, but the former method would involve a larger motor, and so the latter is usually favoured. As the load is lessened one or more of the engines may be shut down, and the motor field reduced to enable the generators to be fully loaded. All existing equipments are controlled on the Ward-Leonard principle; the motor speed is regulated by generator voltage, the engines running at constant speed.

In heavy seas current swings up to 150 per cent. are common, but lack of engine overload capacity will prevent their prolongation, so that overload relays can be set well above the normal and be arranged for the instantaneous tripping of the exciting system.

Electricity in the Large Modern Store

IN an address to the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS on Tuesday last Mr. D. Winton Thorpe dealt with "The Electrical Installation of a Large Modern Store." Of all the many uses of electricity for the purpose, he said, lighting was the most important. A light failure would result in pilfering and loss of sales.

A store was similar to a place of entertainment, but its lighting arrangements were not governed by legally binding rules. The electrical installation called for the services of an electrical consultant, but too often the proprietors of the stores left everything to the architect, and the electrical man was not called in until everything else had been settled; this resulted in the specification being prepared hurriedly and in difficulties to the contractors owing to the tube runs having been already allocated.

The views of the proprietors of the store must be paramount in deciding the positions of electrical apparatus. Space was so valuable that it was often necessary to cramp the electrical apparatus. The installation must possess enough elasticity to be adaptable to changing requirements without having recourse to l.c. and c.t.s. cable to extend the prevalent screwed-barrel system.

The supply could best be balanced by using all three phases for all types of loads. Preferably, no two adjacent lighting points should be on the same phase, in order to reduce the risk of total failure, but this would entail the switches being at least six feet apart. Proprietors generally preferred small groups of switches localised, and quick switching was essential.

When dealing with heating it was a mistake to refer to "units consumed," in view of the many auxiliary expenses eliminated compared with other methods. The low-temperature system was to be preferred as the only method that permitted of an absolutely constant temperature with immediate control by thermostat.

The maintenance of the electrical installation by a good firm of contractors was advocated.

The Production of Lighting Glassware

Professor W. E. S. Turner, D.Sc., Sheffield University, recently lectured to the SHEFFIELD ILLUMINATION SOCIETY on "Glass in the Service of Illumination." Mr. J. F. Colquhoun, public lighting engineer, Sheffield, was in the chair. Professor Turner mentioned that two types of furnaces were used for producing this glass: the pot furnace and the tank furnace. Only the former type was used up to late in the nineteenth century. The pots are made of fireclay, and hold as little as ¼ cwt. up to 2 tons, with an average amount of glass of 15 to 25 cwt.; the pots themselves may weigh from 15 to 25 cwt., and are about 3 in. thick. The time required for melting varies according to the heat of the furnace and type of glass required. The mixture is melted to about 1,400 deg. C., allowed to cool off until it becomes like treacle, when it can be gathered at the end of the glass blower's pipe, and shaped as required. Professor Turner estimated the production of electric light bulbs in this country to be between 70,000,000 and 80,000,000 a year; in the United States it is 400,000,000 a year. Reference was made to a factory in Holland where ninety-six men worked around an eight-pot furnace, 15 or 16 ft. in diameter, and each produced about 100 bulbs per hour. The Westlake machine goes through the actions of hand-blowers, and produces between 70,000 and 90,000 lamps per day, i.e., one machine does the work of 100 glass blowers. In the manufacture of tubing and rodding, molten glass flows on to a rotating mandril and is drawn by machinery over pulleys at the rate of from 100 to 250 ft. per min. Under the old manual method of making tube, only thirty per cent. of it was of any value, and this varied considerably both in thickness and diameter. Replying to questions on opal glass and its absorption of light, Professor Turner said that it was necessary to have some element in suspension in the glass, which was itself opaque; opal glass was being made in this country with an absorption of only fifteen per cent. Amber domes had been tried in miners' lamps, and were thought to have alleviated nystagmus.

The greyhound racing track at Boundary Park, Norwich, showing the G.E.C. lighting installation, in which a new type of racing track reflector has been used

Wood Cross-arms Wanted

"Some Line Insulator Criteria" was the subject of a lecture given by Mr. R. C. Andersen to a largely attended meeting of the South Wales Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS at Cardiff on Saturday last. The lecturer dealt graphically with the design, construction and capabilities of insulators suited to the varied conditions met with in different parts of the country, while of particular interest were the references made to conditions affecting overhead lines in South Wales, where engineers had to contend with salt spray deposits and other difficulties as bad as, if not worse than, those met with in any other part of the country. Several members, including Mr. Idris Jones and Mr. C. T. Allan, submitted specimens and photographs of insulators which had broken down. Mr. Andersen said he did not feel too happy about the insulation of some of the lines which had been and were being erected under the grid scheme. Between Barking and one of the seacoast towns they were cleaning insulators once a week, and around Glasgow they were cleaning them once a fortnight. In his opinion, a good deal of the 33-kV trouble would be got rid of if they could use wood cross-arms.

Invention and Production

To the Royal Scottish Society of Arts at Edinburgh, on Monday (November 7th) Mr. Sam Mavor, of Messrs. Mavor & Coulson, electrical engineers, Glasgow, spoke on "Suggestion Schemes and Other Incentives to Works Production." Referring to foreign competition he said we could only continue to compete successfully if for the higher rates of wages we obtained a higher scale of individual production. Increased flow of production was mainly due to scientific and technical progress and organisation.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Multiple Earthing

Will you kindly give me space to inform Mr. F. W. Purse, and others, that the question of multiple earthing need not be considered, although it would preferable to the existing system of earthing at the point of supply, and using insulated neutral conductors. Concentric wiring, with the outer uninsulated, on the two-in-series system, has several months' priority over the fire offices' interfering rules requiring two insulated conductors, and had I been supported by my employers in 1882, the mischievous green-covered pamphlet that caused so much argument in the early days would never have been flourished at the I.E.E. meetings.

Granted that our industry is perhaps a little more technical in its working details, I have yet to learn that knowledge of elementary electricity is insufficient for either working the production of electrical energy, or for wiring our houses in an economical and foolproof manner.

Lee, S.E.12, *November 9th.* E. G. PINK.

The Beckenham Town Hall

In the fourth paragraph of the article on the new Beckenham Town Hall which appeared in your issue of October 28th you refer to the fact that " the buildings as a whole are heated by thermostatically controlled electro-radiators." The radiators used are our " Electrorads." With regard to the question of local electric storage water heaters, thirty-four of our " Unity " water heaters with self-contained ball-cock tanks were supplied for this building.

Finally, referring to your last paragraph, you give our name amongst the contractors as being responsible for heating and ventilating; this is actually incorrect, as Messrs. Young, Austen and Young, Ltd., 12, Buckingham Street, Strand, W.C.2, were the contractors for this part of the work and the apparatus which we have mentioned was supplied by us to Messrs. Young, Austen & Young, Ltd.

Westminster, S.W.1. BARKER, YOUNG & CO., LTD.,
November 8th. R. C. Symondson.

Clearing the Air

In your issue of September 30th, under the above heading, the following statement appears:—" One-eighth of our population dies annually from causes traceable to impure air."

Who is responsible for this serious state of affairs? Surely it cannot be the gas undertakings in an organised attempt to avenge the unkind remarks made about their product, from time to time, in the REVIEW?

Now that the truth about Britain's poisonous atmosphere has at last been published, many people like myself will no doubt write to Messrs. Thos. Cook's for advice on where to spend their next leave, where the purity of the air can be guaranteed.

Colombo, Ceylon, *October 25th.* FUMIFUGIUM.

Distribution—National or Local?

Many times lately we have been warned that the management of the distribution side of electricity may be taken in hand. It was recommended by Mr. Nichols Moore in his I.M.E.A. presidential address and it has been referred to in other quarters. The problem to be solved is whether we are to continue as at present, each district making its own arrangements, or whether a central body is to be set up to control distribution nationally.

The difficulties arising from the present method are obvious enough, but the reasons for these difficulties are not always recognised. The tariffs certainly are an odd assortment, but there is method in their madness. Towns quite near each other have different conditions with different types of load, and it by no means follows that the same tariff would suit all of them. Some have lost their factory load and have to rely on lighting load, and others suffer from unemployment and have to adopt special methods to keep their plant employed. Other towns have grown up as dormitories for adjacent towns, and they require special treatment. Some towns are burdened with old plants which they cannot replace owing to lost loads, while others have expanded suddenly and are equipped with the latest and most efficient generating plant. Tariffs have to be varied to meet these conditions.

The grid supply will not help matters at first as existing capital expenditure will remain and cause financial charges. Some towns which are doing well now expect their electricity at very cheap rates to compete with existing costs, and apparently others which are less favourably situated must pay a higher price. How would a centralised control deal with all these points? Would it help matters by fixing a standard tariff, the same for the working class town and the prosperous town where most people own cars? One may doubt the wisdom of such a proposal. A new tariff may be mathematically equitable, but will it please people?

Headquarters control introduces other problems. It means filling up forms and delays in dealing with urgent demands. Are control boards to send out notices to all distributing engineers telling them what apparatus and plant and appliances they are to use, so that the industry may be run on Post Office lines? If this is to be the case, where is to be the opening for the new idea or the alternative method? Those in authority working with advanced system do not like new ideas: they interfere too much with the system.

The relations between the electrical manager and the public would become departmentalised, which would not be an improvement. At the present time the manager of an electricity department is open to be approached on the golf course or in the tramcar or even at a bridge party with a request for assistance in connection with the supply, and everyone expects and receives courtesy, but no one ever expects that kind of treatment, say, from an income tax official.

It is difficult to see how the I.E.E. and our excellent technical Press would continue to function under departmental control. Think of the questions in Parliament if someone stated in an I.E.E. discussion that some method of working was unsafe, and an accident followed. " Is it not a fact that it was known that this method of working was unsafe, and has the man responsible been discharged? "

There is abundant room for improvement, but let it be real improvement.

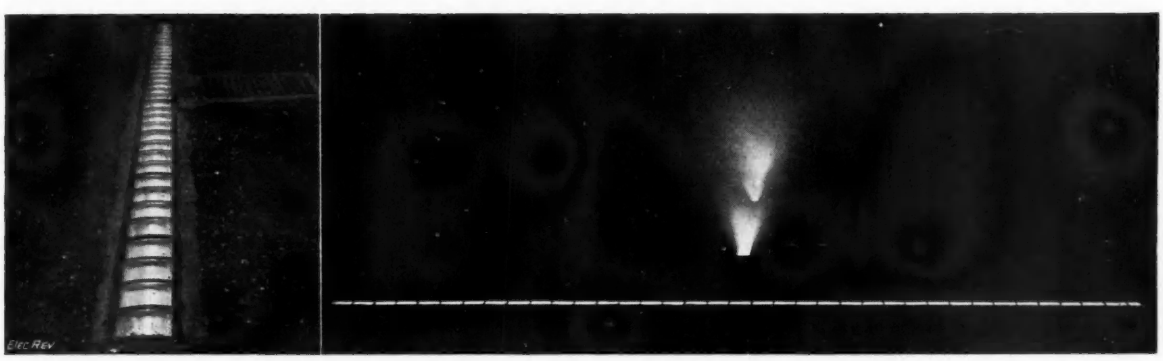
November 14th. BOROUGH ELECTRICAL ENGINEER.

Domestic Four-wire Services

Mr. Colin Pidd has stated his case so well that I am at a loss to reply. I certainly must admit that a four-wire service, under conditions of derangement, might give the unfortunate results suggested. Nevertheless, I have not heard of a domestic fatality between phases; whereas I can distinctly remember at least three cases of shock to earth proving fatal in recent times.

Domestic accidents are fortunately rare compared with the enormous number of connected consumers, but I still consider ments, or whether a central body is to be set up to control distribution nationally.

Warrington, *November 13th.* N. S. BYERS.



Guiding lights for landing aeroplanes at Croydon Air Port **(see page 762)**

Wiring by Supply Authorities

I read in your November 11th issue W. H. T. & Co.'s letter, and, while I fully agree with them that something should be done, I can go one further.

In this district, Bermondsey, wiring is done free of charge and on deferred payments, and lamps are given away free of charge to free-wiring consumers, but there is still something worse for the contractors. I was asked by a tradesman to estimate for replacing three outside gas lamps, also to remove a main switch and fuseboard and move the service from a passage to a cellar, a distance of about 8 ft.

When the Council was approached to alter the service it wanted to charge £14, but at the same time it offered to do the whole of the other work and also paid up the remaining one year's maintenance due under the gas company's contract.

In another instance I tendered for a small installation for a café, but the proprietor gave the job to the Council because he was told by an official that if he gave it to a contractor there might be some delay or difficulty in getting the service laid on. Can any contractor compete against this sort of procedure?

Just after the war I approached the then chairman of the Electricity Committee and got the Department to restore the pre-war condition of laying up to 60 ft. of main free. Now on the application forms this appears:—"Service: the consumer will be charged the cost of so much of any electric line for the supply of energy to any owner or occupier as may be laid upon the property of such owner or in the possession of such occupier." I think that this is most misleading to the average would-be consumer, and gives the feeling that if a contractor does the job he will be charged for the service.

I would like to be a member of the Electrical Contractors' Association, but it is so difficult in the face of the facts I have given (and I could mention more) to get a living in the borough of Bermondsey.

Bermonsdey, S.E.1, *November 14th.* E. J. ARNOLD.

Our Diamond Jubilee

We note with interest that you celebrate your sixtieth birthday on Tuesday next, and we take this opportunity of offering you our hearty congratulations upon the event. This serves to remind us that we are now entering into our forty-first year.

We venture to express the hope that the coming year may lift from the economic horizon the grave clouds which darken the outlook and that when you celebrate your sixty-first birthday, the outlook will be as cerulean blue as the cover of the ELECTRICAL REVIEW.

Manchester, *November 11th.* WARD & GOLDSTONE, LTD.
M. H. Goldstone.

Congratulations on sixty years' good service from a reader of the past thirty-eight years.

RELIANCE ELECTRICAL WIRE CO.
London, E.C., *November 15th.*

The Public Health Exhibition

ELECTRIC vehicles are again prominent at the Public Health and Municipal Transport Exhibition at the Agricultural Hall, Islington, this week. Electricars, Ltd., are showing a 2-ton vehicle fitted with a dust-tight body with sliding doors, and electrically operated hydraulic tilting gear. A small milk-delivery van and a valve rectifier set for battery charging are recent introductions by this company. The General Vehicle Co., Ltd., exhibits a 2-ton low-loading vehicle with special contoured sliding doors, and a 3-ton all-steel refuse collector

In addition to several examples of electrically driven unchokable pumps, Harland Engineering Co., Ltd., have on show a new float switch equipment. An adjustable (level) copper ball float on a brass rod operates a simple control switch in conjunction with the Brookhirst automatic panel controlling the pump equipment. This company is commencing to make automatic a.c. starters.

On the stands of Tudor Accumulator Co., Ltd., and the D.P. Battery Co., Ltd., emergency lighting systems are demonstrated. "Keepalite" control gear in conjunction with a shadowless operating theatre lamp manufactured by Kelvin, Bottomley & Baird, Ltd., is employed in the latter case, and "Safetylyte" equipment with a representation of cinema lighting is shown by the Tudor Co.

Weir and flume water measuring demonstrations on the stand of Messrs. George Kent, Ltd., suggest applications in connection with cooling-water supplies. Very little loss of head is the advantage of the flume method. There is a Venturi recorder which can be used, in conjunction with an orifice, for steam measurement, oil meters for oil-furnace and oil-engine supplies, boiler feed-water meters, and a complete electrical receiving recorder by which boiler output figures, &c., are remotely indicated in a continuous diagram covering a month. Flume water measurement is also demonstrated by the Lea Recorder Co., Ltd., which also has examples of feed-water and coal meters

Multi-purpose Vacuum Cleaners

A new vacuum cleaner by Hoover, Ltd., incorporates a free wheel on the brush drive. The fan is rubber covered to prevent "sand blast," and the fan casing is also rubber lined. The steel wheels have rubber tyres and ball bearings. The bag has a "Sorbo" gasket and is secured by quarter turns of two cam-operated fasteners with wing nuts. The Tellus Vacuum Cleaner Co., Ltd., shows a spraying attachment for paint, disinfectant, &c., which is applicable to any of its models, and also an attachment for hair drying. In both cases the machine is used as a blower.

Food preparation machines exhibited by the Peerless Electrical Manufacturing Co., Ltd., include a general purposes machine, a vegetable parer, a meat mincer, a kneader and a coffee grinder, all with built-in motors. A two-deck electric roasting oven on show represents a new departure by this company. Messrs. Mabbott & Co., Ltd., are showing the Marvel potato-cleaning machine.

A roasting oven seen on the stand of Messrs. Benham and Sons, Ltd., measures 24 in. by 24 in. by 46 in. inside the oven, has side, back and top elements with a total loading of 11 kW, and is fitted with four shelves, a drip tray and a gravy catcher. An electro-vapour radiator shown has a 500-W loop-type element.

Easiwork, Ltd., displays "Thor" washing and ironing machines. An ironing attachment can be applied to the domestic machines in the same way as the wringer. There is a model equipped with heating elements. An electrically heated food trolley displayed by Magrini, Ltd., has five containers in the top and two shelves in a hot-cupboard beneath. There is also a cold shelf at the bottom. The whole measures 2 ft 6 in. by 1 ft. 9 in. by 3 ft. 6 in. high.

Electro-medical Appliances

Apparatus for producing ozonised oxygen for medical treatment (internal and external) is exhibited by Ozonair, Ltd., as well as a surgical unit and a combined filtering, ozonising and heating equipment for flats, offices, &c. Messrs. Parker, Winder & Achurch, Ltd., are showing their electrical steriliser, and the Philips Industrial X-Ray Division is displaying several portable Metalix X-ray equipments. Some X-ray photographs were seen on the stand of Portable X-Rays, Ltd. Apparatus for chlorinating condenser circulating water represents a recent development by Wallace & Tiernan, Ltd.

Among the products of the Bould Reflector Lamp Co. are lamps treated with pure silver which is protected with a deposit of copper. Among various products shown by Messrs. J. H. Tucker & Co., Ltd., we saw tumbler-type switch-plugs with the plugs at the top of the switches set at an angle round about 45 deg. from the vertical. The "Robot Fireman" exhibited by Combustion Engineering, Ltd., is a small edition of the mechanical "Underfeed" stoker applicable to boilers of the type used in hotels and public institutions. The complete equipment includes the electric drive and thermostatic control. The "Lindsay Turbulator" produced by this company is designed for fitting behind the bridges in the flues of Lancashire boilers to give complete turbulence of the gases, and to improve the rate of heat transfer.

Current in Tramway Axle Bearings

The current for driving an electric tramway motor in its return path flows through the lubricated axle-bearings. The insulating film of oil must be constantly punctured by the voltage in order to give free passage to the current, resulting in rapid wear by electric corrosion of the bearing surfaces. All axle-bearings of the trains on the Berlin municipal railway have been equipped with a protecting device consisting of bronze rings fitted on the axles, with bronze brushes in contact with them. The brushes may be also applied directly to the axles. The voltage drop between the rings or between the axles and the brushes being less than a few tenths of a volt, the film of oil in the bearings is no longer disturbed by the passage of current; this is especially important in the case of ball-bearings, owing to the point-shaped surface of contact. A load of 65 to 75 A per sq. in. is maintained on the contact surface of the carbons. Repairs to the bearings have been appreciably reduced since the adoption of this device.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Steam Meters

The latest designs of the type "T" steam meter for power stations of GEORGE KENT, LTD., Luton, are suitable for any size of steam unit, and are supplied in four varieties: "T/D" gives a continuous record by means of a pen on a chart; "T/CD" has both a chart and an integrator or counter, with a series of dials; and "T/PD" and "T/PCD," respectively, of the chart only and chart-integrator pattern, which includes an automatic pressure-correcting device.

All the "T/D" meters operate on the orifice principle, a fitting being inserted in the steam pipe, the orifice having somewhat less cross sectional area than the pipe. Under these conditions the slight difference in pressure caused between the upstream and the downstream side of the orifice plate is proportional to the square of the amount of steam passing. This pressure difference is measured by means of spring loaded metal diaphragms, the higher (upstream) pressure being taken to the exterior of the diaphragms, and the lower (downstream) side to the interior; the pressure difference is recorded directly, by both the chart and the integrating device, as lb. of steam passing per hour and total lb. respectively.

Various standard orifice fittings are used according to the condition. That of the "D" design is typical; this consists of a circular steel carrier or frame, consisting of a machined steel forging 1¾ in. thick fixed between the flange and steam pipe, and carrying a monel metal orifice plate of either the circular or "chart" type. Contained in the carrier are two pressure holes which lead to two short vertical cooling chambers, filled with condensed water, alongside the steam pipe. One of these holes connects to the up-stream side of the orifice and the other to the down-stream side; both are coupled by narrow bore copper pipes to the recording portion of the meter, situated in any convenient adjoining position, the pressure difference being transmitted through condensed water with which the whole circuit is filled.

The recording portion of the "T/PCD" steam meter, for example, has at the top a clock, around which the chart is wrapped, and a pen which draws a curve; below is the integrator or counter with the row of dials and an indicator pointer. The automatic pressure correcting gear, situated between the recording chart and indicator and the integrator, is constructed as a rule on the principle of the Bourdon tube, adjusting the readings through linkwork so as to eliminate automatically all errors due to varying boiler pressure; it is claimed to be accurate to within plus or minus 2 per cent. as an outside range, even with a strongly fluctuating load.

A Double-tariff Prepayment Meter

BRITISH INSULATED CABLES, LTD., Prescot, Lancs, have designed an inexpensive mechanism which can be fitted to their standard prepayment meter to reduce automatically the rate per kWh after a predetermined amount has been consumed, the point at which the reduction occurs being fixed by the setting of a dial. This new type of double tariff a.c. meter, priced at £3 18s. 6d., has, in addition to the usual "units consumed," "total coins paid," and "coins unused" dials, a fourth dial that is accessible to the collector only. This dial rotates as energy at the higher rate is consumed, and on reaching "zero" changes to the lower rate until reset; the consumer can see from the indicator on this dial the amount yet to be used before the rate changes.

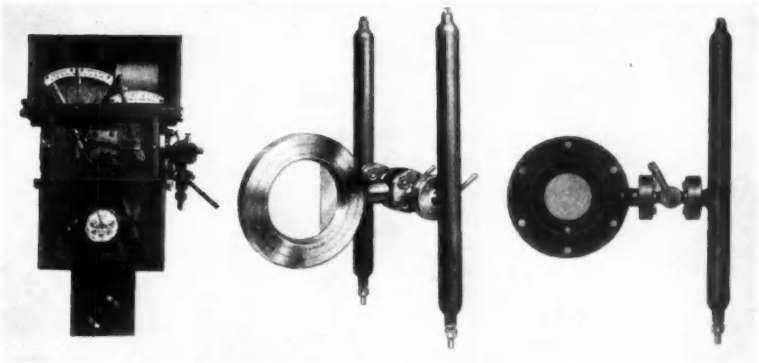
The new "B.I" prepayment meter

No elaborate calculation is required in deciding the setting for the high-rate units, as this figure is the fixed charge for the period in pence divided by the difference between the high and low rate in pence. Thus if the rates are 6d. and 1d., respectively, and the fixed charge 15s. per quarter (180d.), the high rate units would be 180 divided by 6−1, *i.e.*, 36. The fixed charge may be varied as between summer and winter or for any other period.

Where it is not desired to collect a fixed charge, the double-tariff meter will serve to collect the meter rent and thus avoid the inequity as between consumers of varying amounts of increasing the unit rate for the purpose. It can also be set so as to secure the rental of a free-wired installation or cooker. The advantages of the principle of this type of meter were considered in an article published in the ELECTRICAL REVIEW of October 7th.

An Upsetting Machine

A new method of forming heads on rods is introduced in the automatic electric upsetting machine marketed by MESSRS. MARRYAT & PLACE, 40, Hatton Garden, E.C.1. The principle of the machine is essentially that of the resistance welding machine, but differently applied. The bar to be headed is



Left: The new "Kent" type "T/P C D" steam meter. Centre: the type "D" orifice fitting, with chord orifice plate. Right: Type "P" orifice fitting

gripped by a pneumatically operated water-cooled copper clamp fitted with V-shaped jaws, tightly enough to make a good electrical contact, but still allowing the rod to be pushed through it against a water-cooled steel faced copper anvil. There is a short gap between the clamp and the anvil which form the two terminals of the low-voltage high-current transformer.

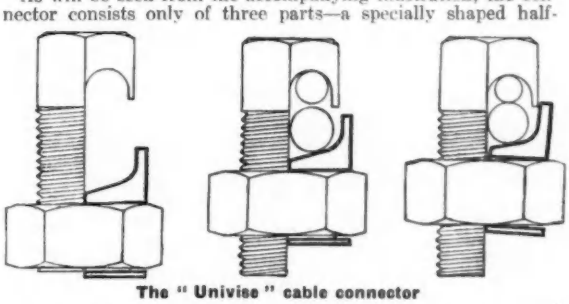
When the metal reaches its ductile point the longitudinal pressure on the rod forces more metal up, so forming a head. When sufficient material has been pushed up the current is automatically cut off and the air pressure released. The rod is then placed in the press without any further heating. The system is claimed to be much faster than any other method of producing such parts. It also dispenses entirely with the furnace or forge, and only the exact amount of metal required is pushed into the upset, so that there is a minimum of subsequent machining. In a motor car engine valve the only operation after the press is the grinding of the seat. Another point worthy of mention is that no skilled labour is required.

There are three sizes, the smallest dealing with light steel rods up to ¾ in. in diameter, the second from ¾ in. to 1¼ in., and the largest working from this size bar up to 2 in. in diameter. They are arranged for working on single phase a.c. of any commercial voltage and frequency.

The "Univise" Cable Connector

A new cable connector, the "Univise," has recently been brought out in France by the SOCIÉTÉ FRANCAISE DU CONNECTEUR "UNIVISE," 20, Rue d'Agnesseau, Paris 8. Its chief feature is the fact that the cables are securely connected by a single nut, no locknut or other securing device being necessary.

As will be seen from the accompanying illustration, the connector consists only of three parts—a specially shaped half-



The "Univise" cable connector

screwed stud, a loose half jaw-piece, also screw-threaded, and a nut embracing both the stud and the jaw-pieces.

In the first position the connector is ready to receive the cables, the jaw-piece lying parallel to and as an easy fit against the stud; in the next the two cables are seen in position, the jaw-piece being still parallel with the stud but not tightened up. As the nut is screwed up, the jaw-piece is slightly tilted, its lower edge becoming so tightly welded against the stud (as can be seen in the final position) that any loosening of the cable connection is claimed to be impossible.

Cooker Control Units

The latest development of MESSRS. J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall, is a range of cooker control units of the enclosed ironclad type.

The double pole main switch is rated at 30 A at 250 V, and is of the q.m. and b. type with the operating handle interlocked with the lid. The auxiliary circuit has a double-pole q.m. and b. switch with a 3-pin British standard gauge socket and handshield plug. The pilot light circuit is suitable for a 15-W sign type lamp and a ruby lens is incorporated.

A 30-A "Crabtree" cooker control unit

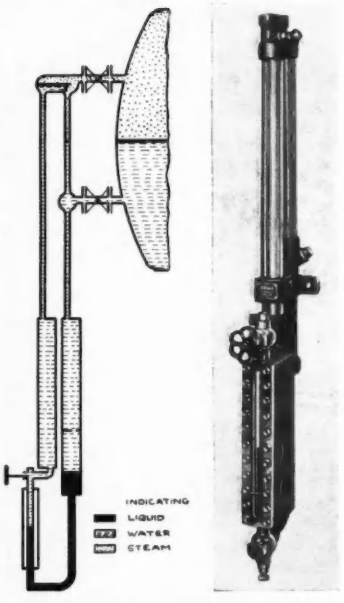
Both external and internal earthing terminals are provided as standard, and there are knock-out discs at the top, bottom and back of the case. The cooker cable outlet is through a bushed hole at the bottom of the case, and the overall dimensions are 10¼ in. by 9⅜ in. by 4½ in.

The unit with a 5-A auxiliary circuit costs 22s. in bright black enamel, and 27s. 4d. with a 15-A auxiliary circuit. In each case an interlocking switch socket on the auxiliary circuit costs 1s. 4d. extra, and mottled grey vitreous enamel finish adds a further 4s. 4d. to the price.

Remote Water-level Indication

In our recent description of the new Ironbridge power station reference was made to the "Igema" distance water-level indicator, produced by MESSRS. JAMES GORDON & CO., LTD., Windsor House, Kingsway, W.C.2. With the growth in height of modern water-tube boilers, the need for remote indication of the water level in the drums is very pressing.

The "Igema" reproduces the water level at the firing floor in an unmistakable way, and a column of red liquid corresponds to the normal gauge-glass water column. There are no actual working parts such as floats, contact devices, &c., and suitable traps and baffles are combined in the system to ensure that the indicator does not lose its effectiveness by dirt getting into it and obscuring the glass.



An "Igema" water-level indicator (Left) Diagram showing connections to boiler drum, &c.

One connection is made to the steam space and the other to the water space of the drum. The water level in the former is maintained at a definite height by the condenser fitting, whilst the water level in the other leg varies as the water level in the boiler drum.

The indicating liquid is insoluble in water and is not affected by pressure. It has a density higher than that of water and the actual movement of the water level in the boiler drum is accurately represented in the indicator. The accuracy is in no way affected by pressure variations in the boiler system.

We learn that the boilers in the new Battersea power station will all be equipped with these indicators, and that the London Power Co. already has a number working at its various stations. Among other stations using these indicators are Portobello, where there are sixteen, Bradford, Barton, West Ham and Clarence Dock. One of the indicators has been supplied for a special high-pressure boiler, 1,575 lb. per sq. in., in Scotland.

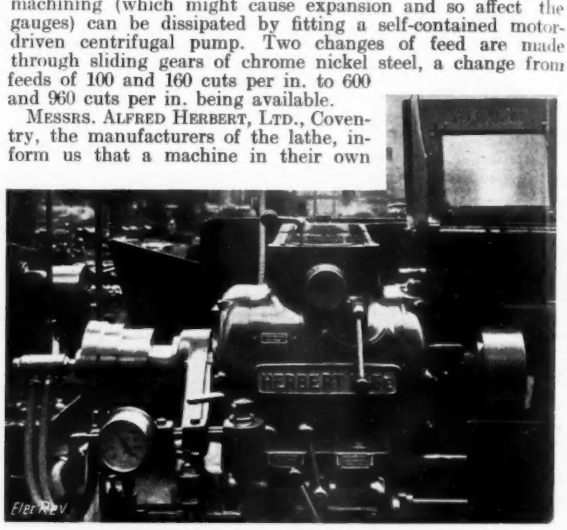
An All-electric Headstock

The new Herbert No. 5E capstan lathe has been designed for high-speed chucking in connection with non-ferrous metals. The headstock is a 3-h.p. four-speed s.c. motor, the rotor of which is mounted on the main spindle of the lathe. The control gear is built into the headstock, and a lever at the front operates a drum switch which gives forward, stop, and reverse connections.

A d.p. contactor protects the machine from overloading and also prevents the restarting of the lathe after cutting off the supply unless the lever is in the off position. A selector switch built into the top of the headstock gives finger-tip control for obtaining 500, 750, 1,000, and 1,500-r.p.m. operation.

The spindle carrying the rotor is mounted on pre-loaded anti-friction bearings to take both journal and thrust loads. When working to very fine tolerances, the heat generated in machining (which might cause expansion and so affect the gauges) can be dissipated by fitting a self-contained motor-driven centrifugal pump. Two changes of feed are made through sliding gears of chrome nickel steel, a change from feeds of 100 and 160 cuts per in. to 600 and 960 cuts per in. being available.

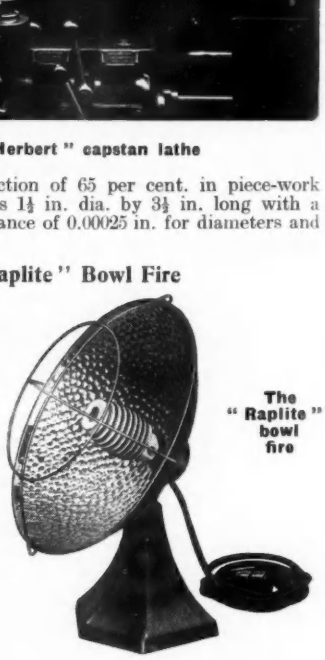
MESSRS. ALFRED HERBERT, LTD., Coventry, the manufacturers of the lathe, inform us that a machine in their own plant has effected a reduction of 65 per cent. in piece-work prices and has bored holes 1¼ in. dia. by 3½ in. long with a single-point tool to a tolerance of 0.00025 in. for diameters and parallelism.



The new "Herbert" capstan lathe

The "Raplite" Bowl Fire

Among the range of "Raplite" domestic electrical appliances which is now being supplied by MESSRS. BAXTER & CAUNTER, LTD., 33-37, Alfred Place, W.C.1, is the bowl fire shown in the accompanying illustration. This comprises a polished hammered copper reflector, in which is fitted a 600-W element, swivel-mounted on an ornamental cast base. The price of this fire is 9s. 6d.



The "Raplite" bowl fire

An Electric Window-cleaner

An illustration appeared on page 607 of our issue of October 21st, 1932, of a novel window-cleaning apparatus. This is the invention of MR. W. H. TURNER, 85, Mosley Street, Manchester. The "Nu-este" machine is a portable self-contained unit comprising a universal motor, driving shaft, gear head, and cylindrical mops. The machine is designed to climb under its own power, and therefore only needs guiding. With the standard model the operator can reach between ten and eleven feet high, while there is a smaller model for show cases.

"Workslite" Reflectors

The latest development by THE WARDLE ENGINEERING CO., LTD., Old Trafford, Manchester, is the type "D Workslite" reflector. This model incorporates the Wardle hinged easy-wiring housing accommodating a H.O.-type skirted porcelain lampholder. The vitreous enamelled reflector is securely attached to the copper canopy, although it can be removed easily and slipped over the lamp for cleaning.

A Ward'e "Workslite" reflector with canopy detached

Three different types of housing caps are available: the standard cap has an outlet for ¾-in. conduit, the "C" type cap is provided with holes for direct attachment to British Standard boxes, and the "H" type cap incorporates a cast hook for chain suspension. The prices of the type "D" reflector range from 14s. 9d. for Model 5682, 14 in. in diameter for 100-W lamps, to 29s. 6d. for Model 5686, 18 in. in diameter, to take 500-W lamps.

New Books

Admiralty Handbook of Wireless Telegraphy, 1931. Pp. viii+ 1012. Figs. 512. London: H.M. Stationery Office. Price 7s. 6d.

Although this book was prepared at the Signal School, Portsmouth, for the information and guidance of officers and men of H.M. Fleet, there is no other comparable textbook of wireless telegraphy which can be purchased at so small a cost. Like the 1925 edition it should be suitable for candidates for the Postmaster-General's marine wireless-operators' certificates, though there is a good deal in it which is outside the range of knowledge required for the certificates.

Telephony receives very scant treatment in comparison with telegraphy, but even in the case of the latter some important commercial aspects, such as machine working, are not included. Some applications, such as auto-alarm apparatus, of special interest to mercantile marine operators, are also omitted. The Navy apparently still finds it convenient to adhere to its unit of capacity, the "jar," though whatever convenience the "jar" may have has never been sufficient to cause its adoption elsewhere. Some notes on elementary mathematics and a few mathematical tables are contained in appendices, and there is an appendix which gives a sort of "child's guide" to wireless for "junior officers and ratings."

Lichtbogen-Stromrichter für sehr Hohe Spannungen and Leistungen. By Dr. Ing. Erwin Marx. Pp. 167, and 103 illustrations. Berlin: Julius Springer. Price 17 Rm. in paper covers.

This book deals with an improved form of arc rectifier especially suitable for very high voltages and powers. It forms a complete record of experimental work carried out at the Technische-Hochschule at Braunschweig.

The rectifier consists of an arc in moving air, between water-cooled, specially shaped metal electrodes. These are supported at a suitable distance apart (according to the voltage) in a closed chamber with walls of insulating material. Magnetising coils surround the electrodes to induce rapid rotations of the arc, and air, under one or two atmospheres excess pressure, is pumped into the chamber and passes out through central openings in the electrodes at high speed, for the purpose of cooling and de-ionising the arc parts and so preventing the possibility of "back-firing" during the idle half-cycle.

The spacing of the electrodes is chosen well in excess of the normal sparking distance of the supply voltage, and the arc is started artificially in each working half-cycle by means of an independent voltage surge, two or three times as high as the working voltage, introduced into the circuit by means of a Tesla transformer and synchronously rotating contact-maker. This form of rectifier is completely reversible *i.e.*, it can convert d.c. into a.c. (single, three or six phase) as readily as a.c. into d.c.,

The book shows that a single rectifier chamber about one metre long and .4 metre in diameter, could deal with an output

An unorthodox cable entry. This lorry from the British Insulated works swerved to avoid a collision with a 'bus, with the result depicted. Nobody was injured

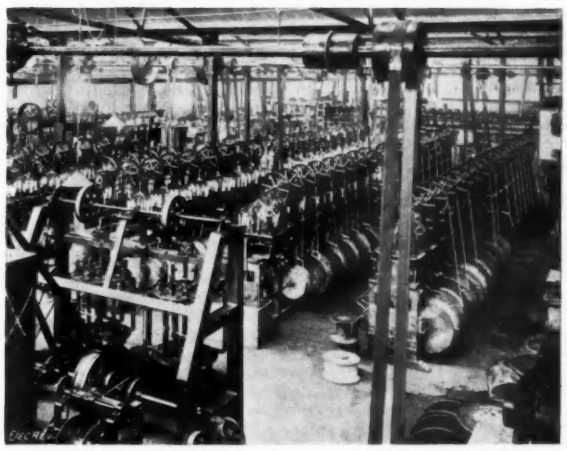
of at least 10,000 kW at about 50,000 V d.c., whilst d.c. pressures up to 400,000 V or more are considered quite feasible. A good bibliography of the subject is included.

Telephony. By T. E. HERBERT and W. S. PROCTOR. Pp. xxi+ 1218. 2nd edition. London: Sir Isaac Pitman and Sons. Price 20s. net.

The rapid development of all aspects of telephony during recent years has necessitated considerable amplification both of matter and treatment in this second edition of a well-known manual. So much so that the present volume, designated Volume 1, excludes machine switching, which will be treated separately at a later date.

As a detailed exposition of the manual switching systems and line plant of the General Post Office, this volume is, as one would expect from official information, exceedingly good to read, and is no doubt of great value to the large numbers of technical men employed by the Post Office who cannot come into personal contact with more than a fraction of the apparatus described in view of the complexity of the telephone service.

The first sixth of the text is unfortunately taken up with very elementary expositions of fundamental theory, so that the book shall cover a specified list of examinations. The Post Office has an admirable series of booklets on the elements, and they can be acquired as desired and replace much that detracts from the present text. There is much in the Post Office which we would like to know more about, but in this outline the reader must have recourse to the many references to augment abbreviated descriptions. The reader is not reminded that



A corner of the main braiding shop of the Ediswan Cable Works (see p. 741)

other countries do some things differently; a hint of foreign practice, which must be available to the P.O. for international links, would be of great use to those engaged in telephone manufacture for export. We note that the detached notion for relays is used in anticipation of its value in machine switching systems; this is a great help to the student, as uniformity in these matters is very important.

Elementary Metallurgy for Engineers. By G. F. C. Gordon. Pp. 156; figs. 26. London: Constable & Co., Ltd. Price 8s. 6d.

The author, who is the superintendent of engineering workshops at Cambridge University, has had considerable experience of the teaching of metallurgical science. It is difficult to cover adequately such a wide field in the limited space of a small volume, but Mr. Gordon has most successfully emphasised the salient points, indicated the outstanding features, and in a few instances referred to the more modern developments in metallurgical science.

After dealing with the testing of materials, the author discusses fatigue in metals, and shows that metals subject to corrosion exhibit far less resistance to fatigue. A subsequent chapter is devoted to a study of metallography and macrography as applied to metals and their properties. In dealing with modern tendencies in the iron and steel industries, the author shows how steel castings have replaced wrought-iron forgings in the production of locomotive wheels, and suggests that within a few years the manufacture of wrought iron will be abandoned entirely. A brief outline is given of the advantages possessed by alloy steels over simple carbon steels, and how the former attain to such properties as red-hardness in the case of high-speed steels and resistance to corrosion in the case of stainless steels.

A final chapter deals with the selection of materials, the importance of utilising materials of standard quality, and shows how constant revision of ideas is necessary in view of further experience and the developments of modern scientific research. Recent studies relating to corrosion phenomena have led to changes in the construction of condenser tubes, improvements in roller bearings have shaken our faith in engine "brasses," and the apparently impregnable position of high-speed steel is being threatened by the advent of non-ferrous cutting materials. The volume is a valuable introductory text for engineering students, and the descriptive matter is well illustrated.

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Shorter Notices

"The True Road to Radio." Pp. 245. Illus. Price 5s. Ferranti, Ltd.—The third edition of this publication, full of technical information and excellently produced, includes additions to and revisions of matter contained in its predecessors. The book gives a considerable amount of information on band-pass circuits, including the Ferranti a.c. mains "Band-Pass Three." The section dealing with h.t. supply units has been revised to cover the latest types of valve rectifiers and several new pages have been devoted to an explana-

tion of grid bias in response to requests received for information on the subject. Technical men and amateur constructors alike will find much useful information in this work.

"Short-Wave Radio Reception." By W. Oliver. London: W. Foulsham & Co., Ltd. 1s. net.—This work is intended chiefly for ordinary listeners embarking on short-wave work and requiring guidance on this special branch of reception in order to get the maximum interest out of it. It explains the principles and peculiarities of short-wave reception clearly and concisely. Possibilities of world-wide reception with simple apparatus are followed by hints on adapting or building sets for short-wave work. Other matters dealt with include the operation and calibration of short-wave sets, identifying stations, and the remedying of faults. Detailed lists and tables show the distribution of call-letters among the countries of the world, &c.

"Einführung in die Tonphotographie" (Introduction to Sound-photography). By Dr. John Eggert and Dr. Richard Schmidt. Pp. 137; figs. 122. Leipzig: Verlag S. Hirzel.—This work has been compiled in conjunction with the scientific central laboratory of the photographic department of the I.G. Farbenindustrie A.G. ("Agfa"). A survey is made of photographic processes and sound reproduction, including mechanical and electrical acoustics. The latter section, occupying twenty-three pages, deals among other things with microphones, amplifiers, loud speakers, and photo-electric cells.

"Ten Years of Industrial Psychology." By H. J. Welch and C. S. Myers. Pp. 146. London: Sir Isaac Pitman. Price 6s.—This book gives an account of the first decade of the National Institute of Industrial Psychology and its industrial and commercial investigations. A list of books and reports written by the staff of the Institute appears at the end of the book.

"Conference Internationale des Grands Réseaux Electriques à Haute Tension." 1931 Session.—In three volumes. Pp. 859 +615+1042. Published in Paris by the Conference authorities.

"Pitman's Engineering Educator." Edited by W. J. Kearton. 2nd edition. To be completed in about 30 fortnightly parts. Each part 1s. 3d.

"Industrial Psychology in Practice." By H. J. Welch and G. H. Miles. Pp. 249; figs. 142. London: Sir Isaac Pitman and Sons. Price 7s. 6d.—An attempt has been made by the authors to supply information in a simple and popular form regarding the principles and practice of industrial psychology. The book is illustrated by hundreds of examples of the practical applications of these principles and is intended for employers, managers, and employés alike.

"Small Transformers," by A. H. Avery. No. 53, "Model Engineer" series. Pp. 56; figs. 45. London: Percival Marshall & Co., Ltd. Price 9d.—With the aid of this book the amateur will find himself quite able to build his own transformers and calculate the sizes and windings to suit all voltages and frequencies. There are plenty of illustrations.

"Faraday's Diary." Vol. I; Pp. 467. Vol. II; Pp. 430. Edited by Thomas Martin with a foreword by Sir William H. Bragg. London: G. Bell & Sons. Price £12 12s. for the complete set of seven volumes.

"Electronics," by R. G. Hudson. Pp. 135; figs. 45. London: Chapman & Hall. Price 12s. 6d.

"Electromagnetism," by E. B. Moullin. Pp. 279; figs. 152. London: Oxford University Press. Price 17s. 6d.

"Photo Cells and Their Application," by V. K. Zworykin & E. D. Wilson. Pp. 331; figs. 180. London: Chapman & Hall. Price 18s. 6d.

"Electric and Magnetic Fields," by S. S. Attwood. Pp. 314; figs. 154. London: Chapman & Hall. Price 21s. 6d.

"The Two-cycle Engine," by C. F. Caunter. Pp. 277; figs. 137. London: Sir Isaac Pitman & Sons. Price 15s.

The Calendar of the University of London, University College, contains 561 pages, giving the full programme and prospectus for the year 1932-3.

"Kelly's Directory of the Engineering, Hardware, Metal and Motor Trades, 1932." Pp. 2,867. London: Kelly's Directories, Ltd. Price: £2 5s.—This year, in addition to all the usual features, a section relating to trades connected with the wireless industry has been included. Among the headings are wireless apparatus manufacturers; wireless component parts and accessories manufacturers; loud speaker manufacturers; wireless metal pressings; radio-gramophone makers; receiving set dealers and manufacturers; wireless relay services; wireless supplies dealers, retail and wholesale; valve manufacturers; and electrical instrument manufacturers.

"The Design of Fans for Cooling Electrical Machines," by R. Poole. Pp. 49; figs. 16. London: The Draughtsman Publishing Co. Price 2s.—This handy little booklet goes into some detail regarding the design of various types of fans, while one section deals with the efficiency of a fan with volute. A further section includes the radial blade type and pressure drop and the baffling effect of end windings. There are numerous diagrams, half-tone illustrations, tables, and graphs.

"Short-wave Wireless Communication," by A. W. Ladner and C. R. Stoner. Pp. 348; figs. 201. London: Chapman & Hall. Price 15s.

Great Britain's Electrical Imports in 1931

THE annual statement for 1931 of the import trade of the United Kingdom has recently been published. It gives a much more detailed classification than the monthly accounts of the countries of origin entering the United Kingdom. On this statement is based the following table showing the principal items of electrical goods and apparatus and machinery imported last year, together with the increases or decreases compared with 1930.

	1931. £ (Thous.)	Inc. or dec. as compared with 1930.
Wires and cables, rubber, insulated (not telegraph or telephone)—		
Total	273	+ 44
From Germany	159	+ 13
„ Belgium	43	+ 25
Wires and cables, insulation other than rubber (not telegraph or telephone)—		
Total	497	— 207
From Germany	193	— 61
„ Netherlands	122	— 166
„ United States	76	+ 10
Telegraph and telephone wires and cables—		
Total	29	— 3
From Germany	16	— 6
Submarine telegraph and telephone cables—		
Total (from British countries)	24	+ 24
Radio receiving sets (excluding valves)—		
Total	525	*
From United States	353	
„ Netherlands	98	
„ Germany	65	
Radio transmitting apparatus (excl. valves)—		
Total (from foreign countries)	6	*
Radio valves—		
Total	349	+ 151
From Austria	155	+ 35
„ United States	74	+ 57
„ Netherlands	57	+ 42
„ France	30	+ 5
Other radio parts and accessories—		
Total	948	*
From Germany	449	
„ Netherlands	209	
„ United States	149	
Other telegraph and telephone apparatus—		
Total	84	—
Carbons, lighting—		
Total	30	— 2
From Germany	24	— 1
Carbons, furnace—		
Total	48	— 21
From United States	42	— 23
Carbons, other—		
Total	153	+ 60
From France	128	+ 56
Insulating cloth and tape—		
Total	56	— 22
From United States	45	— 21
Lamps, 20-V and over, gas-filled—		
Total	232	— 27
From Austria	111	— 39
„ Netherlands	45	— 52
Lamps, 20-V and over, other—		
Total	147	— 64
From Austria	70	— 61
„ Japan	27	+ 19
„ Netherlands	25	— 16
Lamps, under 20-V, for flash-lamps—		
Total	85	— 5
From Japan	41	—
„ Germany	36	— 5
Batteries, for hand flash-lamps—		
Total	144	+ 13
From Germany	82	— 19
„ United States	33	+ 27
Batteries, other—		
Total	405	— 160
From Germany	210	— 134
„ Denmark	78	— 18
„ Netherlands	62	— 15
Accumulators, portable—		
Total	68	+ 8
From Germany	32	+ 13
„ Sweden	20	— 1
Accumulators, stationary—		
Total	12	— 6
Electric bell apparatus (not telegraph or telephone)—		
Total (mainly from Germany)	34	+ 4
Lighting accessories and fittings (incl. switches)—		
Total	562	+ 70
From Germany	360	+ 87
„ United States	89	+ 11
Ammeters, voltmeters, etc.—		
Total	66	— 25
From Germany	32	+ 9
„ United States	19	— 18
House service meters—		
Total	140	— 3
From Germany	77	— 4
„ Switzerland	57	+ 1
Electro-medical apparatus (other than X-ray)—		
Total (largely from Germany)	37	+ 1
X-ray tubes and vacuum tubes—		
Total	18	— 10
Elec. goods and apparatus not elsewhere specified—		
Total	1,024	+ 60
From Germany	469	+ 85
„ United States	243	+ 10
„ Switzerland	118	— 31
Grand total goods and apparatus	6,240	— 787
Generators, a.c.—		
Total	15	— 8
From United States	10	+ 5
Generators, d.c.—		
Total	11	— 9
Motors, a.c., not traction—		
Total	162	— 6
From United States	66	—
„ Sweden	51	— 7
Motors, d.c., not traction—		
Total	153	— 70
From United States	123	— 50
Convertors and transformers, rotary—		
Total	16	+ 5
Convertors and transformers, static—		
Total	61	+ 29
From Switzerland	47	+ 43
Control and switchgear—		
Total	46	+ 7
From Sweden	28	+ 22
„ United States	11	— 17
Vacuum cleaners—		
Total	793	+ 29
From Canada	341	+ 47
„ United States	205	— 35
„ Germany	94	+ 37
„ Sweden	85	— 5
Elec. machinery, not elsewhere specified—		
Total	377	— 158
From United States	182	— 132
„ Germany	56	— 41
„ Switzerland	51	+ 28
„ France	36	— 7

* Comparative figures not available.

Parliamentary News (BY OUR SPECIAL REPORTER)

THE following Special Orders have recently been approved :—For the amendment of the Blandford Forum Electricity Orders, 1911 and 1924; for the amendment of the Newcastle-upon-Tyne Electric Lighting Order, 1891; amending the London and Home Counties Electricity District Order, 1925; in respect of part of the rural district of Saint Thomas, Devon; for the transfer of the undertaking authorised by the Invergordon and District Electricity Special Order, 1923; in respect of the burgh of Stornoway and part of the parish of Stornoway, in the county of Ross and Cromarty; and in respect of the county of Nairn and parts of the counties of Aberdeen, Banff, Kincardine, Moray, Inverness, and Ross and Cromarty.

L.N.E.R. Electrification

On November 9th, Sir Philip Dawson asked the Minister of Transport whether, in view of the hardship to people living in the area of Waltham Abbey, Bishop's Stortford, and the bulk of places served by the London and North-Eastern Railway Co. from Liverpool Street Station, he would take steps to hurry on the electrification, which had long been proposed.

Mr. Pybus said that the Railway Company had informed him that it had schemes of London suburban electrification under consideration and that in the event of the London Passenger Transport Bill becoming law it would be prepared to submit proposals to the Standing Joint Committee of the Transport Board and the railway companies under the Bill.

New Forest " Pylons "

On November 10th, Mr. Perkins asked the Minister of Transport whether he would state the number of " pylons " that the Electricity Commissioners proposed to erect over the New Forest, the height of these pylons, and the area of land enclosed by each.

Mr. Pybus said that the application of the Central Electricity Board would involve the construction of nineteen towers. The height of these might vary from 60 to 70 ft., and the bases of the towers were from 14 to 20 ft. sq.

Broadcasting Revenue

On November 14th, Mr. Doran asked the Postmaster-General whether, in view of the necessity for economy in national expenditure, he was prepared to take steps to adopt the proposal made in the May Report, 1931, and reduce the present amount paid to the British Broadcasting Corporation out of receipts from wireless licences.

Sir Kingsley Wood said that the position as between the Exchequer and the B.B.C. was duly reviewed at the time in the light of the recommendations of the Committee on National Expenditure. As shown in the Post Office Estimates, the B.B.C., in view of the national emergency, agreed to forgo, by way of contribution to the Exchequer, in the present financial year, the sum of £150,000.

Empire Broadcasting

On November 14th, Mr. Doran asked the Postmaster-General if he would state the estimated cost of a year's upkeep of the new Empire broadcasting station at Daventry; how many hours in the day it was likely to transmit; and what proportion of the upkeep was to come out of the present sums paid to the British Broadcasting Corporation.

Sir Kingsley Wood said he was not in a position to give an estimate of the cost of upkeep, the whole of which would, for the time being, be borne by the B.B.C. He understood from the Corporation that the new Empire service would begin with transmissions for about seventy hours a week.

Canada and Storage Batteries

On November 15th, Mr. Cocks asked the President of the Board of Trade if he would state the value of the imports into Canada for each of the last five years from the United Kingdom and from other countries, respectively, of electric storage batteries composed of plates measuring not less than 11 in. by 14 in. and ¾ in. thick; and whether he could give an estimate of the total annual production of these articles in this country.

Dr. Burgin said that particulars of the imports into Canada of the articles in question were not available from the Canadian trade returns. As regarded the production of electric storage batteries in this country the particulars available did not distinguish these batteries according to the dimensions of the plates of which they were composed.

Legal

THE action by the St. James' & Pall Mall Electric Light Co., Ltd., against the City of Westminster Assessment Committee and Another came before the Court of Appeal, consisting of Lords Justices Scrutton, Greer, and Slesser, last week, on the appeal of the Assessment Committee from the judgment of a Divisional Court of King's Bench.

The company claimed that the gross and rateable values of its lands, buildings, machinery, and cables for the supply of electricity should be reduced from £110,000 and £55,001 respectively to £72,664 and £36,322. The L.C.C. had been empowered to purchase compulsorily the undertaking of the company in 1931 or at the expiration of any subsequent period of ten years. These rights were later vested in the London & Home Counties Joint Electricity Authority by an Act providing for the transfer of the company's undertaking to it on December 31st, 1971. The terms were that the " physical assets " existing at the date of the establishment of the Joint Electricity Authority should be transferred to the Authority free of charge and such of the " physical assets " as should have been provided subsequently should be paid for by the Authority.

It was also provided that the company should provide two sinking funds to the liquidated value of the " physical assets " transferred to the Authority. The company's contention was that in arriving at the rateable value of the hereditaments the sums which they were required to set aside for the sinking funds should be excluded from the receipts or allowed as a deduction therefrom.

The Divisional Court, on the appeal of the company, held that the company's contention was right and that the gross and rateable values of the hereditaments in question should be reduced to £72,664 and £36,332 respectively. From this result the Rating Authority now appealed.

Mr. Tyldesley Jones, in opening the case for the appellants, said the question raised by the case was of the utmost importance to every electric light company, not only to those in London but all over the country, and the ratepayers. He contended that the decision of the Divisional Court had proceeded under a mistake. He submitted that the right method of assessing the hereditaments was to endeavour to arrive at what rent a hypothetical tenant would take them and what revenue he would be likely to receive after paying all outgoings. Having read the special case which had been stated, the hearing was adjourned.

Upon the resumption of the case on November 9th and 10th, Mr. Tyldesley Jones said that the company contended that it levied charges to cover not only working expenses and capital charges, but also the sinking funds. Therefore some part of the gross charge was levied simply for the sinking fund and the gross receipts in the calculation made for rateable purposes ought to be reduced by that amount. That proposition, he submitted, was absolutely wrong. In assessing the company's hereditament, the Act said the gross value was to be the annual rent which a tenant might reasonably be required to pay. If the landlord had to set aside a sinking fund it was a liability he retained even if he retired from the undertaking, and the sinking fund in the case of the respondent company would remain its obligation even though it sublet its hereditament. Counsel cited a number of cases which he maintained supported his contention.

On November 11th Mr. Miller, for the respondent company, supported the decision of the Divisional Court, holding that when an electricity undertaking was required by statute to set aside out of its revenue certain sinking fund payments to provide for the ultimate transfer of the undertaking to a Joint Electricity Authority, those sinking fund payments were proper deductions from the profits of the undertaking in arriving at the rateable value, since no hypothetical tenant would pay a higher rent to collect money from which he could derive no benefit. He submitted that the Divisional Court had applied the rules relating to rating cases correctly.

At the conclusion of the reply on behalf of the appellants, the Assessment Committee, their Lordships reserved judgment.

Second-hand Lamps

In the Chancery Division on November 11th, Mr. Justice Eve granted over until November 18th, on the application of the British Thomson-Houston Co., Ltd., an injunction restraining Pryce's Stores, Ltd., Fulham, S.W., from selling second-hand electric lamps as " Mazda " lamps.

Mr. R. E. Shelley, in support of the application, said the defendant offered the lamps at 1s. 6d. each.

A representative of the defendants said he was merely selling exchanged lamps as such and not as new ones. Moreover, he was not selling any more, but he asked for a week's adjournment of the motion, which was granted, on the terms of the interim injunction as before stated.

Permec, Ltd.

In the Companies Court, on Monday, Mr. Justice Bennett, on the petition of Marconi's Wireless Telegraph Co. and others, made an order for the compulsory winding up of Permec, Ltd.

The Ward Electrical Co., Ltd.

In the Chancery Division, Companies Court, on Monday, Mr. Justice Bennett had before him a petition for the winding up of the Ward Electrical Co., Ltd.

Counsel stated that this was the company's own petition. It had stood over to enable a scheme to be presented. A scheme had now been agreed by the creditors, but delay had been caused owing to the difficulty in finding somebody to take the chair at a meeting of the creditors. A chairman had now been found and the meeting had been fixed. He asked that the petition should stand over for four weeks.

His Lordship directed accordingly.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources, Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The F.B.I. and Empire Trade

A memorandum presented by the new Empire Committee (of which Sir Hugo Hirst, Bt., is chairman) to the Executive Committee of the Federation of British Industries advocates a close following-up of the results of the Ottawa Conference and a further investigation into those questions which were not finally settled at the Conference. The co-operation of British interests with a view to the presentation of the views of the various industries before the Tariff Board is another aim of the Empire Committee, as well as the study and encouragement generally of methods of developing Empire trade. The despatch by organisations representing individual industries of missions to the Dominions, India and the Colonies is to be facilitated for the purpose of investigating the problems of complementary production and co-ordinated sales policy.

The Erith Electrical Exhibition

An electrical exhibition was held recently at the Erith Council offices, at which there was a varied display of domestic

Floodlighting at the Erith Electrical Exhibition

electrical appliances made by leading manufacturers. The exhibition was originally intended to run for one week only, but proved so successful that it was extended for a further week. The accompanying illustration shows the Council's building which was specially illuminated during the show.

Trade with Canada

The opportunities for increasing trade between Great Britain and Canada are analysed in the monthly letter of the Royal Bank of Canada for November. It is stated that, while the proportion of goods imported into Canada from Great Britain has not greatly changed since the concessions made at the Ottawa Conference came into force, the price level generally in Great Britain and the cost of manufacture should be sufficiently low to enable British producers to offer goods at prices which will prove decidedly attractive. It will take time to build up new trade connections, to establish agencies and service organisations, and the Canadian public has not yet become accustomed to British trade names. British goods have a reputation for high quality, and this reputation will react very greatly in their favour.

Light in Advertisement

Typical examples of the way in which modern electrical illumination can be employed to display commercial buildings of all classes to their utmost advantage, and thereby act as a powerful publicity medium, are contained in an attractive publication just issued by the British Electrical Development Association, entitled "Light for Advertising" (publication E.D.A. 1054). Numerous excellent illustrations depict various types of installations at works, offices, shops, hotels, theatres and cinemas, and there are suggestions for making use of waste wall space for floodlighted posters. A blank space is provided on the back page of the booklet for overprinting purposes.

A Chelmsford Electrical Exhibition

Several new labour-saving devices are on view at the exhibition of the Electric Supply Corporation, Ltd., opened in the Shire Hall at Chelmsford on November 14th, which continues throughout the week. The majority of the exhibits consists of household appliances. The companies represented are Siemens Electric Lamps & Supplies, Ltd.; Crompton Parkinson, Ltd.; Hailwood & Ackroyd, Ltd.; Berry's Electric, Ltd.; Credenda Conduits Co., Ltd.; Jackson Electric Stove Co., Ltd.; Revo Electric Co., Ltd.; L. V. Hasler; Ferranti, Ltd.; Frederick Thomas & Co., Ltd.; County of London Electric Supply Co., Ltd.; Hoover, Ltd.; Singer Sewing Machine Co., Ltd.; British Vacuum Cleaner Co., Ltd.; and Edison Swan Electric Co., Ltd.

Electrical Machinery Exports in October

Below is given an analysis by countries of the exports of electrical machinery from the United Kingdom during October, with notes of increases or decreases as compared with the corresponding month last year :—

	QUANTITIES.		VALUES.	
	Oct., 1932.	Inc. or Dec. as compared with Oct., 1931.	Oct., 1932.	Inc. or Dec. as compared with Oct., 1931.
	Tons.	Tons.	£	£
European countries	657	— 210	141,042	— 52,295
Japan	—	— 2	919	— 721
South American countries ...	52	— 48	21,056	— 10,482
South and South-West Africa ...	122	— 18	27,437	— 3,711
British India	328	— 117	68,117	— 19,223
Australia	84	+ 69	2,945	+ 8,935
New Zealand	47	— 47	19,120	— 10,413
Canada	89	— 248	45,653	— 36,309
Other countries	250	— 758	133,930	— 92,426
	1,629	—1,379	£460,219	— £216,645

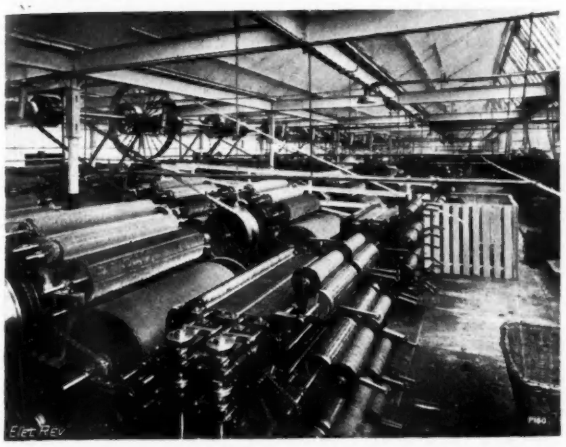
Our usual monthly table relating to the United Kingdom's overseas trade generally in October appears below.

British Overseas Electrical Trade in October

	EXPORTS.			IMPORTS.			RE-EXPORTS.		
	Electrical exports for Oct., 1932	Inc. or dec. as compared with Sept., 1932.	Inc. or dec. as compared with Oct., 1931.	Electrical imports for Oct., 1932.	Inc. or dec. as compared with Sept., 1932.	Inc. or dec. as compared with Oct., 1931.	Electrical re-exports for Oct., 1932.	Inc. or dec. as compared with Sept., 1932.	Inc. or dec. as compared with Oct., 1931.
Insulated wires and cables ...	£99,645	+ £24,282	— £30,576	£24,026	+ £1,187	— £59,576	£164	+ £106	— £1,075
Electric carbons	3,377	+ 1,063	+ 1,442	8,963	— 3,304	— 15,522	14	— 24	— 73
Arc lamps and searchlights ...	458	— 797	+ 107	—	— 80	— 276	—	— 36	— 13
Incandescent lamps	39,942	+ 10,745	+ 12,857	23,344	+ 8,486	— 36,658	365	— 284	— 421
Other lighting apparatus ...	26,458	+ 1,951	— 9,383	26,884	+ 794	— 51,739	1,775	+ 552	+ 400
Batteries and accumulators ...	57,199	+ 4,622	— 23,961	6,651	— 1,566	— 71,994	118	+ 62	— 576
Meters and instruments ...	22,376	+ 3,781	— 6,382	24,422	+ 4,759	— 15,593	380	+ 277	— 119
Unenumerated electrical goods and apparatus	93,962	+ 8,028	— 38,628	68,332	+ 12,897	— 68,170	4,807	+ 3,166	— 2,382
Telegraph and Telephone Cable and Material—									
Telegraph and Telephone wires and cables (not submarine)	30,309	+ 10,428	+ 12,432	172	— 159	— 3,894	—	— 18	— 2
Submarine telegraph and telephone cables	105,392	+ 101,042	+ 101,281	—	—	—	—	—	—
Telegraph and telephone apparatus	157,501	+ 38,602	+ 273	135,748	+ 9.789	— 167,309	3,989	+ 2,627	— 1,990
Electrical Machinery—									
Railway and tramway motors	494	+ 113	— 1,003	—	—	—	—	—	—
Other motors and generators ..	90,514	— 5,304	— 107,138	—	—	—	—	—	—
Unenumerated electrical machinery	152,566	+ 7,146	— 108,504	44,590	+ 7,343	— 182,998	5,463	— 95	— 3,695
Total	£880,193	+ £205,702	— £197,183	£363,132	+ £40,146	— £673,729	£17,075	+ £6,333	— £9,946
Decreases for the first ten months of the year... ...		Exports. £2,262,424			Imports. £3,047,141			Re-exports. £100,021	

No Time Wasted

During a recent Thursday afternoon, the Yorkshire Electric Power Co. was informed that a main-line shaft driven by a steam engine had fractured at the Nunroyd Mills of Messrs. J. J. L. & C. Peate (Guiseley), Ltd., at Guiseley, near Leeds, and was asked to arrange for a temporary scheme to drive the affected departments. The instructions to prepare the scheme were received at 8.30 p.m. on Thursday, and at 10.30 a.m. on Saturday the various departments were running at practically full output. The power company, in conjunction with the engineer of the mill, Mr. J. Gordon, undertook the installation of the necessary motors, switchgear and all wiring, the cables alone amounting to approximately 1,100 yards and the total h.p. of motors to about 300.



A portion of Nunroyd Mills, Guiseley, where the Yorkshire Electric Power Co. recently carried out an emergency power installation in thirty-eight hours

To ensure immunity from a repetition of such an occurrence, Messrs. Peate, after giving careful consideration to the cost of conversion and the cost of power from the public supply and the many manufacturing advantages accruing, have now made an agreement with the power company for the whole of their power requirements, amounting to approximately 1,000 h.p.

Engineers and the 40-hour Week

At a conference of nearly all the trade unions connected with the engineering trade, held at York on November 15th, the question of a 40-hour week without reduction of pay was considered. *The Times* states that it was decided to form a committee to examine facts and to organise, if necessary, propaganda meetings with a view to approaching employers to give effect to the demand.

A Canadian Factory for Blackburn

The Mayor of Blackburn has received a cablegram confirming provisional arrangements with Messrs. Moffat, Ltd., of Western Ontario, electrical appliance makers, for opening a factory at Blackburn. The company, which is well known all over the world for its electric cookers, water heaters, refrigerators, &c., proposes to take over the extensive India Mills (illustrated), which are fully equipped electrically. A director and two foremen are sailing shortly from Montreal, and several hundred people, it is hoped, will be employed eventually.

Australian Duties on Oil Engines

The Australian Tariff Board, which recently made an investigation into the position of crude-oil engines, recommends that as large engines cannot be built economically in Australia, those of more than 100 h.p. should be admitted free of duty under the British preferential tariff, with intermediate and general rates of 10 per cent. and 15 per cent. respectively. It suggests, however, that these engines should be admitted free from all countries until the United Kingdom has developed further the manufacture of engines of very large horse-power. As the Board considers the local manufacture of smaller engines worth encouraging it recommends that the rates under the 1921-30 tariff should be adopted for engines of from 50 h.p. to 100 h.p. These rates are: 45 per cent. British preference, 55 per cent. intermediate, and 60 per cent. general. The same rates are favoured on engines up to 50 h.p., but no formal recommendation is made because these sizes were not referred to the Board for inquiry. The existing tariff applies to all sizes, but the rates mentioned above were raised in March last to 55 per cent., 65 per cent., and 75 per cent. respectively.

Wise Spending

Publicity matter has been issued by the United Dominions Trust, Ltd., relating to the desirability of everybody spending money at the present time upon things which will make work and relieve unemployment. The Trust emphasises the argument that wise spending on a credit basis will carry the country very much farther than if it is limited to one's cash ability. We are all urged to use our credit as well as our cash for having done *now* in our houses contracting or other work that we were really intending to put off until another day; or if we are factory or works owners scrapping our obsolete equipment *now* in immediate favour of the up to date. In these ways men will be brought back into employment, and will themselves become spenders of actual earnings.

Registered Electrical Contractors

Applications for registration from the following were accepted by the Executive Committee of the Electrical Installation Contractors at its last meeting:—

Fair, G., Old Trafford, Manchester.
Cambridge Electric Co., Blundellsands, Liverpool.
Taylor, A., Cheetham Hill, Manchester.
Scrace, W., Strangeways, Manchester.
Provincial Electrical Co., Chorlton-on-Medlock, Manchester.
Hall, T., Leamore, Walsall.
North Cheshire Electric Co., Cheadle Hulme.
Vertue, J. J., South Croydon.
Steer & Worsley, London, W.12.
Jackson & Booth, Ltd., Congleton.
Griffiths, D. A., Oswestry.
Miller, F. G., Withington, Manchester.
Bonham Electrical & Engineering Co., Ltd., Willington Quay-on-Tyne.
Vanstone, W., Ltd., London, W.C.2.
Peters, J. J., Rock Ferry, Ches.
Wilkinson, J., Didsbury, Manchester.
Sparkes, A., Manchester.
Height Engineering Co., Salford, Manchester.
Hibbs & Gibson, Stockport.
Irving, J., & Sons, Ltd., Glasgow.
Plant, J. H., Ltd., Bromley, Kent.
Dick-Cleland Bennett & Co., Ltd., Glasgow.
Fleming, J. H., Manchester.
Wilson, S., Withington, Manchester.

At the same meeting thirteen applications were declined.

A Battery-operated Tableau

A 100-V "Kathanode" battery provided by the D.P. Battery Co., Ltd., supplied the power for working a knitting machine which was entered in the Lord Mayor's Show by Messrs. G. Stibbe & Co., in the section illustrating types of modern knitting machines.

New Australian Companies

Companies registered recently in Sydney include: Broadcasting Services of Australia, Ltd. (capital, £20,000); Ionlite (N.S.W.), Ltd. (capital, £10,000), to acquire and exploit the "Ionlite" lighting system; and New System Signs, Ltd. (capital, £10,000), to acquire an electrical advertising device.

Automatic Floodlighting

We recently travelled to Birchwood, Kent, to inspect the method by which the "Bull Inn" is automatically floodlighted. The rays from the head lamps of an approaching car are picked up from the road by a photo-electric cell concealed in the head of the bull above the entrance, causing its red eyes to glow and simultaneously to light up both sides of the hotel in striking fashion. When the vehicle has passed the floodlights are extinguished. In order to avoid continuous illumination when a stream of cars passes, as sometimes happens on this main Folkestone road, provision is made for the lights to be switched off after 20 seconds and to remain off for a minimum of seven seconds. Besides drawing attention to the inn in a more arresting fashion than would be likely by continuous floodlighting, there is an appreciable

The India Mills, Blackburn, which are to be taken over by Messrs. Moffat, Ltd., the Canadian electrical apparatus manufacturers

saving due to the intermittent method; in the present case we were informed it was as much as 60 per cent. Mr. S. E. O. Eades, of Automatic Light Control, Ltd., is mainly responsible for this novel application of the photo-electric cell. We also inspected at Moorgate Hall, E.C., the many other methods of photo-cell control evolved by this company.

Social Events

The Manchester Magnet Amateur Dramatic Society of the General Electric Co., Ltd., is presenting "Nothing but the Truth," by J. Montgomery, at the Milton Hall, Deansgate, Manchester, to-morrow (Saturday). Tickets can be obtained from the Society's treasurer, Magnet House, Victoria Bridge, Manchester.

The annual staff supper-dance of Britannia Batteries, Ltd., was held on November 11th at the Imperial Hotel, Russell Square, W.C., when executives and staff from the company's London office, provincial depôt, managers and representatives, and a large contingent of employés from the factory and offices at Redditch attended.

Among those present were Mr. and Mrs. E. G. Lind, Mr. R. W. Lind (assistant to the managing director), Mr. and Mrs. Bowen (company secretary), Mr. N. F. Cave (works secretary), Mr. A. D. Froggatt (sales manager, Radio Department), Mr. D. Sinclair (sales manager, Stationary Battery Department) and Mrs. Sinclair, Mr. A. Yate (Glasgow office), Mr. Smith (Redditch) and Mr. Burgess (Advertising Department).

Trade Announcements

Western Distributors, Ltd., the registration of which is announced on page 764 of this issue, will take over the sole distributing rights in Somerset, Dorset, Wiltshire, Devon, Cornwall, and the southern part of Gloucestershire of the radio products of Standard Telephones & Cables, Ltd.

Messrs. Hogan & Wardrop, 25, Old Street, E.C.1, are undertaking the distribution in London and the Home Counties of industrial lighting reflectors produced by Rowland's Electrical Accessories, Ltd.

Unalite, Ltd., has removed to larger premises at 7, Lambs Conduit Street, Theobalds Rd., W.C.1 ('phone: Holborn 6388).

"Bakelite" Accessories

We have recently received a sample of a "Bakelite" two-way adaptor with a push-bar switch; the red end of the push-bar protrudes when the switch is "on" and white end when it is "off." Will the senders please communicate with us.

A "Rawlplug" Travelling Showroom

A travelling showroom has just been put on the road by the Rawlplug Co., Ltd., containing samples of "Rawlplugs," "Rawlplug" bolt anchors, wall boring tools, and all the other "Rawlplug" products. As our illustration shows, the interior of the van is attractively set out with display material,

The inside of the new "Rawlplug" van

showcases, &c., while the exterior is given to the exhibition of "Rawlplug" lines on recessed display boards.

The Dumfries Showroom Scheme

The Dumfries Corporation Electricity Committee was criticised at a Town Council meeting on November 10th, when it asked for approval of a scheme for an electrical showroom. The scheme was objected to on the score of expense. It was stated it would cost over £250 a year, and that there was no need for it as all the electrical firms in the town were showing appliances. The Committee's recommendation was, however, adopted by sixteen votes to seven.

Prices of Materials

Messrs. F. Smith & Co. report, November 16th: Electrolytic copper bars, sheets and wire rods, no change. Electrolytic copper h.c. wire, 6$\frac{7}{8}$d., $\frac{5}{8}$d. inc. Silicium bronze wire, 8$\frac{1}{8}$d., $\frac{5}{8}$d. inc.

Messrs. Edward Till and Co. report, November 16th: India-rubber, Para fine, 5d., $\frac{1}{4}$d. inc.

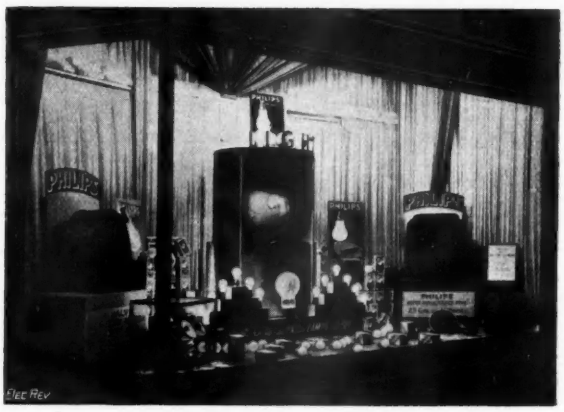
Messrs. James and Shakespeare report, November 16th: No change in the prices of copper bars (best selected), sheet and rod and English pig lead.

Crompton Parkinson Acquire Derby Cables, Ltd.

Messrs. Crompton Parkinson, Ltd., have acquired control of Derby Cables, Ltd. They announce that there will be no changes in the general policy of Derby Cables, Ltd., whose products are already well known at home and abroad. It is anticipated that the business of the cable company will expand, due to its association with the wide selling organisation of Crompton Parkinson, Ltd., and works extensions will be made to increase the capacity of the Derby factory.

A Philips Window Display

The accompanying illustration shows an interesting window display recently arranged by Philips Lamps, Ltd., combining lamps and radio. The central feature of the display is a globe



A radio and lamp display

which slowly revolves, while a cloud effect gives the impression of the sun setting. On either side is a Philips radio set, the remainder of the display consisting of lamps.

Copper Duty Postponed

The Ottawa Agreements Bill was passed through its remaining stages in the House of Lords on November 15th, but provision has been made for the temporary postponement of the duty on copper. During the last few weeks the copper consumers in this country and representatives of nearly all the copper producers in the Empire have discussed the position, and have asked the Government to suspend for the time being the duty on copper other than electrolytic copper. The date on which a duty shall be imposed on electrolytic copper will be decided in the light of a further report from the producers and consumers.

Recent Contracts

An increasing number of contracts have been secured by the Synchronome Co., Ltd., during the last two or three months for the installation of electric clocks in municipal buildings, schools, co-operative societies' premises, hospitals, etc.

The Cambridge Instrument Co., Ltd., has recently received an order for remote indicating instruments to be installed in the control-room at Carliol House, Newcastle-on-Tyne. The installation includes a panel consisting of twenty-four flush-mounted indicators with illuminated scales, arranged in four tiers, each of six instruments. The instruments are for the remote indication of the kilowatts, current, voltage and phase measurements at the North Tees, Dunston and Carville stations of the North Eastern Electric Supply Co. In order to conform with the general scheme of decoration in the control-room, the instrument panel is to be finished in light bronze, while the indicators themselves are finished in bright blue cellulose.

Messrs. Cunningham, Beard & Co., Ltd., have recently been awarded a number of contracts by the Fulham Borough Council under the Council's rental wiring scheme.

The lighting scheme in connection with Barry's £23,000 war memorial hall, which was opened on November 11th, was carried out by Messrs. Campbell and Isherwood, Ltd., Cardiff. It has been specially designed to reveal the architectural beauties of the building.

British Electrical Goods are Best

"The cheap unit is the finest raw material this country can produce," said Sir Hugo Hirst, Bt., at a Forum Club luncheon last Monday, in which he adduced reasons for "buying British." He contrasted the conditions in the electrical industry when he first took a share in it (when labour had not awakened to the justice of its claim for a higher standard of living, cheapness was the main criterion, and foreign competition was unrestricted) with those of to-day. The British electrical industry was now really efficient. Its products were better than those of other countries, *e.g.*, the insulation of our wires, which had to withstand our climatic conditions, was superior, and the rated output of our motors was obtained with a lower temperature rise. The regeneration of other industries was the main object for which the grid had been created. Increase in output must reduce price.

Miss C. Haslett, who presided, warned those who might think of buying foreign electrical apparatus that the plugs supplied would probably not fit the B.S.S. sockets designed for British plugs. She had found British appliances safer and more reliable than the foreign. Lord Meston (president, E.D.A.) gave a brief history of cable development in this country, and claimed that every new electrical appliance connected did something to advance the science and industry of cable making. Mrs. Claude Wilson (chairman, Forum Club) briefly thanked the speakers.

Public Speaking

The latest date for entering for E.D.A.'s public-speaking contest in London and South-East England is December 7th. The competition will be held during the week commencing January 23rd. The dates for other areas can be ascertained from E.D.A.'s Area offices. The National Final Competition between the winners of the Area Competitions will take place in London on March 17th. Editorial reference was made to the matter in our leaderette pages last week under the title "To Speak or Not to Speak."

New Catalogues and Lists

Cambridge Instrument Co., Ltd., 45, Grosvenor Place, S.W.1.—A list illustrating and describing "Cambridge" oscillographs.

Barker, Young & Co., Ltd., Unity Works, Welwyn Garden City, Herts.—A folder showing the various applications of "Unity" tubular heating with details of initial and running costs.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, W.C.2.—The November number of the "Link" containing illustrations of new lighting fittings. Also a leaflet relating to "Tricity" fires.

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.—Publication No. 1250, a schedule of "Benjamin" industrial and commercial lighting fittings.

Crompton Parkinson, Ltd., Bush House, W.C.2.—A list of a few typical users of "Crompton" auto-synchronous motors.

Brook Motors, Ltd., Empress Works, Huddersfield.—A leaflet illustrating some of the stages in the manufacture of the "Brook" motor.

Hart Accumulator Co., Ltd., Marshgate Lane, E.15.—A folder giving information of particular use to electric lighting contractors relating to "Hart" batteries for ½ to 6½-kW lighting plants.

Johnson & Phillips, Ltd., Charlton, S.E.7.—Transformer leaflet No. 75, dealing with a new portable on-load transformer tap changer.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Leaflet No. H.O. 4546, announcing reductions in the prices of "Magnet" tubular heaters.

Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan.—The November "Wigan Review," containing particulars of a prismatic fitting with a "Maltese" glass.

Fraser & Howard, Ltd., 22, Ely Place, Holborn, E.C.1.—A leaflet illustrating and describing the "As-you-like-it" lamp, which can be placed in any position—on walls, bed rails, chair backs, &c.

Hogan & Wardrop, Ltd., 25, Old Street, E.C.1.—A folder referring to "R.E.A.L." industrial lighting reflectors.

Cash, Whitehurst & Co., 85, Hatton Garden, E.C.1.—A folder describing "Cashlight" fittings for desks, tables, pianos, &c.

Euston Electrical Supplies, 310a-312a, Euston Road, N.W.1.—A price list (No. N.732) of electrical fittings and accessories.

Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.1.—A chart giving curves, details, and prices of the current range of "Marconi" valves.

George Humphry, 76, Mallinson Road, Clapham Junction, S.W.11.—Particulars and prices of "Community Service" fuse wire holders.

British Electric Domestic Appliances, Ltd., 3, Hanover Court, E.C.2.—A pamphlet describing the company's authorised dealer scheme and national publicity in connection with the "Mary Ann" vacuum cleaner.

Bankruptcy Proceedings

Jessie M. Kelly (partner in the Norton Electric Co.), wireless manufacturers, 17, Norton Folgate, E.C.—An application was made on November 11th to Mr. Registrar Mellor at the London Bankruptcy Court for an order of discharge on behalf of this bankrupt. The Official Receiver reported that the receiving order was made in November, 1930; the provable debts amounted to £323 and the assets had realised 10s. 6d. The failure was attributed to keen competition and insufficiency of profits to cover overhead charges. The application was opposed by the Official Receiver on statutory grounds, including failure to account satisfactorily for loss of assets, *i.e.*, the stock left on the premises in August, 1930. The bankrupt was also charged with misconduct in that at a time when there were liabilities of the Norton Electric Co. outstanding she took no reasonable steps to preserve the firm's books of account; and that she conspired with others to defeat and delay the creditors of the firm. The discharge was suspended for three years.

F. B. Jewkes (trading as Jewkes Radio and Battery Service), radio dealer, 5, High Street, Wordsley, Staffs.—The adjourned examination was held recently at the Court House, Hagley Road, Stourbridge. According to the statement of affairs the liabilities amounted to £110, while the assets were estimated to realise £45, leaving a deficiency of £65. Debtor attributed his failure to lack of capital, bad trade through general depression, and drawing beyond the profits during unemployment. The examination was closed.

C. T. Watson, radio dealer, 50, High Street, Heanor, Derbyshire.—The first meeting of creditors was held on November 8th at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham. The statement of affairs showed gross liabilities of £213, of which £197 was expected to rank for dividend, and assets of £33, leaving a deficiency of £165. The position was attributed to bad trade and keen competition. The matter was left in the hands of the Official Receiver as trustee.

F. Moorton, radio engineer, 78, Ocklynge Road, Eastbourne.—A meeting of creditors was held recently, at the offices of Messrs. Stapley & Hurst, Eastbourne. Mr. A. E. Orbell, accountant and auditor, 6 and 7, Old Steine, Brighton, reported that the liabilities were £220, due to the trade, and that the net assets amounted to £90, leaving a deficiency of £130. It was decided that the meeting should be adjourned to see whether it was possible to sell the assets by private treaty.

F. R. A. Lock, and **V. C. Lock** (trading as Lock Brothers), electrical engineers, Union Street, Stourbridge.—The public examination was held recently at the Court House, Hagley Road, Stourbridge. The statement of affairs showed liabilities of £322 and assets of £187, leaving a deficiency of £134. The position was attributed to the debtors taking on work which they could not do at the price, owing to inexperience. The examination was closed.

J. R. Lister (Roland Radio), radio engineer, 6, Watford Way, Hendon.—Receiving order made November 7th on debtor's own petition. First meeting November 22nd, and public examination January 20th, both at Bankruptcy Buildings, Carey Street, W.C.

W. H. J. Wilcox, radio dealer, 66, Soundwell Road, Staple Hill, near Bristol. Receiving order made November 2nd on debtor's own petition. First meeting to-day (Friday) at the Official Receiver's office, 26, Baldwin Street, Bristol. Public examination December 2nd at the Guildhill, Bristol.

S. B. Watson (S. B. Watson, & Co.), electrical engineer and contractor, 73, Crouch Street, Colchester.—Trustee, Mr. H. S. Gotelee, 9, Arcade Street, Ipswich, Official Receiver, released October 24th.

F. Moore (F. Moore & Son), electrical contractor, 34, Victoria Gardens, Horsforth.—Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver, released October 21st.

P. F. Franks, electrical engineer's contractor, 5b, Bedford Square, Loughborough.—Trustee, Mr. E. Barlow, 1, Berridge Street, Leicester, Official Receiver, released October 24th.

A. E. Setterfield, electrical engineer, 17, Market Place, Margate, Kent.—This debtor's application for discharge was heard recently at the Guildhall, Canterbury. The discharge was granted subject to one month's suspension.

W. Talbot (City Radio Supplies), electrical dealer, Penny Street, Blackburn.—Receiving order made November 3rd on a creditor's petition. Public examination, December 7th, at the County Court House, Victoria Street, Blackburn.

T. H. D. Pope, electrical engineer, 119, Commercial Road, Swindon.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., appointed November 4th.

N. A. Wileman (A. Wileman & Co.), 141, Commercial Street, Maesteg.—Trustee, Mr. A. J. Rogers, Government Buildings, St. Mary's Street, Swansea, Official Receiver, released October 17th.

H. C. Scholes (Scholes Electric Co.), 37, Albany Road, Chislehurst.—Trustee, Mr. C. J. Pyke, 280A, High Street, Rochester, Official Receiver, released October 12th.

Company Liquidations

J. Holbrook & Tattersall, Ltd., electrical engineers and contractors, 6, Cheapside, and 7, Foster Lane, E.C.—The statutory first meetings were held on November 11th at the Board of Trade Offices, W.C., before Mr. Naunton, Assistant Official Receiver. The liabilities are roughly estimated at £1,500,

The two E.D.A. calendars for 1933, reference to which was made in our last issue, p. 718

against assets valued at £612, of which £600 is due from the London County Council. The failure is attributed to a loss upon a contract. The liquidation was left in the hands of the Official Receiver.

Paris & Partners (Engineers), Ltd.—Winding up voluntarily. Liquidator, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

A. E. Collier & Co., Ltd.—Meetings December 15th at Hoghton Chambers, Southport, to receive an account of the winding up by the liquidator, Mr. J. A. Bond.

W. T. Hodge & Co., Ltd.—Meeting December 15th at 13, Warwick Passage, Corporation Street, Birmingham, to receive an account of the winding up by the liquidator, Mr. N. A. Denson.

Blackpool Radio Installation Co., Ltd.—Meeting, December 10th at 29, Birley Street, Blackpool, to receive an account of the winding-up by the liquidator, Mr. E. Rawcliffe.

Walsall Electrical Co., Ltd.—First dividend of 6s. 8d. in the £. Liquidator, Mr. P. Cozens, Midland Bank Chambers, Bridge Street, Walsall.

Chubbs Automatic Manufacturing Co., Ltd.—Meeting December 19th at 8, Staple Inn, E.C., to receive an account of the winding-up by the liquidator, Mr. P. J. Chaplin.

Electricity Supply

Lighting, Domestic, Power

Amblecote (Worcester).—CHEAPER ELECTRICITY.—The Midland Electric Corporation for Power Distribution, Ltd., has made the following reductions in charges: General lighting, from 6d. to 4¾d. per kWh; works lighting, from 3½d. to 3¼d. per kWh; domestic supply after 2s. per assessed light, from 1d. to ¾d. per kWh. For prepayment meters the charge will continue at 8d. per kWh, but 2½d. instead of 2d. will go towards the cost of installation. Power charges are reduced by 10 per cent. all round.

Aspull (Lancs).—NEGOTIATIONS FOR A SUPPLY.—The Urban District Council has decided to negotiate with the Lancashire Electric Power Co., Ltd., with a view to obtaining a supply of electricity for the town. A suggestion that the Council should install its own plant has been deferred pending the result of the negotiations.

Aylesbury.—NEW ELECTRICITY TARIFF.—The Town Council has adopted the following new scale of charges for the borough:—Private houses: A standing charge of 9d. per annum for each 10 sq. ft., plus 1d. per kWh. Domestic water heating: ¾d. per kWh. Prepayment meter supplies: 8d. per kWh for lighting and 1½d. for other domestic purposes. Shops, business and combined premises: 6s. 6d. per annum for each 25 W demand, plus 1½d. per kWh; reductions ranging from 5 per cent. to 20 per cent. are made where the demand exceeds from 800 to 6,000 W. Refrigerators: 1½d. per kWh. Outside illuminated signs: 4s. 3d. per annum per 25 W, plus 1½d. per kWh. Cinemas and theatres (for a whole supply): 3½d. per kWh. Power: First 500 kWh per quarter, 2d. per kWh; beyond, 1½d. A similar scale of charges has also been introduced for the area outside the borough.

Bideford.—SPECIAL ORDER.—The Bideford and District Electric Supply Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to extend its area of supply so as to include the parishes of Beaford, High Bickington, Huish, Little Torrington, Merton, Roborough, and St. Giles-in-the-Wood.

Birtley (Co. Durham).—STREET LIGHTING.—The Parish Council is to borrow £300 for additional electric street lighting.

Blaina (Mon).—SUPPLY INAUGURATED.—A public supply of electricity provided by the South Wales Power Co., Ltd., was inaugurated last week by Mr. J. L. Adams. Mr. C. T. Allan (assistant manager of the company) presided over a luncheon, at which Mr. J. Shenton (district representative) presented Mr. Adams with an electric table standard. It is proposed to erect further sub-stations in the district, where 100 houses have already been connected.

Burton-on-Trent.—SUPPLY TO TICKNALL.—The Electricity Committee is to supply electricity to premises at Ticknall at a total cost of £1,681.

FRINGE ORDER.—An Order has been obtained authorising the Corporation to supply electricity in the parishes of Marchington, Draycott-in-the-Clay and Hanbury, within the area of supply of the Uttoxeter Urban District Council.

Canada.—ONTARIO COMMISSION CLEARED.—The Royal Commission appointed to investigate certain specified business transactions carried out by the Ontario Hydro-Electric Commission has found that the latter's purchase of the plant and assets of the Dominion Power Transmission, Ltd., for $21,000,000 was "perfectly justified." Regarding the payment to Mr. John Aird, junior, of Toronto, of $50,000 in connection with the purchase of power, and another payment of $125,000 by the Beauharnois Power Corporation to Mr. Aird, the Royal Commission found that this had no relation to the purchase of power by the Hydro-Electric Commission, and that "it would be grossly unjust and improper to find that any political party was involved or expected to derive any advantage from this payment."—*Reuter* (Toronto).

Colchester.—MAINS AND SERVICES.—The Electricity Committee has obtained sanction to the borrowing of £50,000 for mains and services.

Derby.—ASSISTED WIRING.—The Electricity Committee is to apply for sanction to the borrowing of £10,000 for the assisted wiring scheme.

Ealing.—LOAN.—The Town Council is to apply for sanction to the borrowing of £20,000 for expenditure during the next three years in respect of consumers' wiring installations and apparatus for hire or hire-purchase.

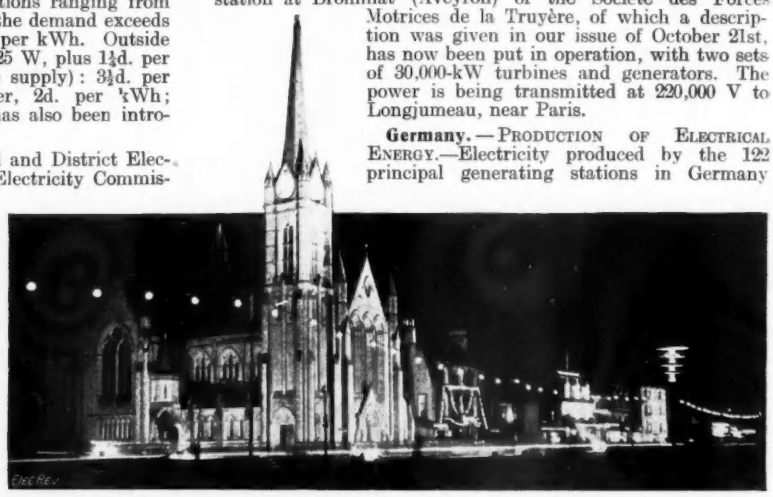
East Westmorland.—THE ELECTRICITY SCHEME.—In reply to a letter to the Electricity Commissioners regarding the position of the electricity scheme for the area, the Rural District Council have been informed that the undertakers, Messrs. Wilkinson (Arnside), Ltd., have transferred the undertaking to a public company. A preliminary survey of the district has been carried out, and tenders have been obtained for certain parts of the work from three firms of contractors. The company is having a report prepared dealing with such matters as suitable tariffs for the various classes of supply, and the policy to be adopted regarding wiring, the sale of appliances, credit facilities, &c.

Felixstowe.—CHANGE-OVER.—The Urban District Council is proceeding to change-over the remainder of the d.c. system to a.c. This will result eventually in a complete bulk supply being taken from Ipswich instead of only a portion.

Formby.—A COMPREHENSIVE INSTALLATION SCHEME.—The Urban District Council has decided to install and maintain (apart from the replacement of lamps) in any residence a complete installation including cooker, wash boiler, four radiators, kettle, iron and immersion heaters at an inclusive charge of £4 12s. 6d. per quarter for a consumption of 3,000 kWh per annum, with the proviso that if the consumption is less or more than 3,000 kWh, a penny per kWh shall be deducted or added accordingly. This arrangement is subject to variation according to the size and type of residence, and it is provided:—(*a*) that the minimum inclusive charge shall be £2 10s. per quarter; (*b*) that for a house already wired for lighting, &c., but hiring a cooker, wash boiler, two radiators, kettle and iron the charge shall be £2; and (*c*) that for a small house wired by the Council with cooker, wash boiler, two radiators, kettle and iron £1 15s. per quarter shall be charged.

France.—NEW STATION OPENED.—The underground power station at Brommat (Aveyron) of the Société des Forces Motrices de la Truyère, of which a description was given in our issue of October 21st, has now been put in operation, with two sets of 30,000-kW turbines and generators. The power is being transmitted at 220,000 V to Longjumeau, near Paris.

Germany.—PRODUCTION OF ELECTRICAL ENERGY.—Electricity produced by the 122 principal generating stations in Germany amounted to 8,200,000 kWh more in July than for the previous month, but was still 181,000,000 kWh below that for July, 1931, for which the total was 1,143,900,000 kWh. The total generated during the first seven months of the year was 7,183,000,000 kWh, as compared with 8,307,900,000 kWh in the corresponding period of last year.



Largs is another seaside resort which is focusing attention upon itself by means of floodlighting. Close to the church above will be observed an unusual type of decorative pole unit which has attracted much attention. For the whole installation seventy-three G.E.C. floodlights and over 8,000 "Osram" lamps were used

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee is to lay distributing mains at a cost of £1,145.

Gravesend.—SUPPLY TO AIR PORT.—The Electricity Committee is to provide a supply of electricity to the Gravesend Aviation, Ltd., at the company's landing ground.

LOAN.—Sanction is being sought to a loan of £450 for a transformer and switchgear, etc., for the Canal sub-station.

Hastings.—REVISED CHARGES.—The Town Council has adopted the following revised scale of charges in the extended areas:—General lighting: First 4,000 kWh per annum, 6d. per kWh; beyond, 4d. General lighting through prepayment meter: 7d. Rental wiring with prepayment meter: 9d. Exterior lighting with three years' agreement: 4d. Shop-window lighting: 3d. Cinema arc lighting: 2d. Power (other than domestic): First 240 kWh per quarter, 1½d.; beyond, 1d. Heating, cooking and domestic power: 1d. Storage water heating: ¾d. Multi-part tariff, domestic and business: "Unit" charge of ¾d. Multi-part tariff (power): Fixed charge of 16s. 8d. per quarter per h.p. of motors installed, plus a "unit" charge of ¾d.

Ipswich.—EXTENSIONS.—The Electricity Committee proposes to lay a main from Martlesham to a proposed sub-station at Trimley, and this will supply the villages *en route*. The Air Ministry has also agreed to take a considerable supply at Martlesham Aerodrome. This cable will act as an alternative feeder for the bulk supply to Felixstowe.

Lichfield.—CHEAPER ELECTRICITY FOR WHITTINGTON.—The charge for electricity at Whittington has been reduced from 8d. to 7d. per kWh for the first 50 kWh a quarter, and to 6d. per kWh beyond.

Liverpool—POWER STATION EFFICIENCY.—"Clarence Dock power station is now the most efficient station in the country," declared Ald. F. C. Wilson, on his re-election last Monday to the chairmanship of the Electric Power and Lighting Committee. He said that last month there was a further increase in the output of electrical energy of 7 per cent., and he hoped that before long they would be producing 300,000,000 kWh a year. If trade were good there was no reason why they should not generate 400,000,000 kWh per annum.

London.—ST. MARYLEBONE.—The Electricity Supply Committee recommends the installation of rising mains at Bowman's Buildings, Carlisle Street, at a cost of £418.

STOKE NEWINGTON.—The Borough Council has received sanction to loans of £5,000 for free wiring purposes and £2,000 for electric cookers.

Lowestoft.—CABLE EXTENSIONS.—The Electricity Committee is to extend cables at a cost of £3,000, of which sum £750 is for a cable to supply St. Luke's Hospital.

Manchester.—CONTINUED PROGRESS.—During September the Electricity Department showed an increase of 3,082 kW in connections, making a total of 514,003 kW. Applications for supplies, including additional supplies, totalled 2,387, representing 4,254 kW in connections. The number of hired cookers now on circuit is 10,390, of which 181 were connected during the month; in addition, there were 202 orders received for the hire of cookers. Two new sub-stations were put into commission and additional plant was installed at five existing sub-stations.

Merthyr Tydfil.—PROPOSED SMALL POWER PLANT.—The Bus Committee has had under consideration the question of installing at the garage generating plant for supplying electricity not only to the garage but also to the Vulcan depôt, the Town Hall, the stables, and the central police station. A sub-committee has been appointed to obtain opinions from consulting engineers.

Moorsley (Co. Durham).—STREET LIGHTING.—The Parish Council is to borrow £580 for the provision of electric street lighting.

New Zealand.—OPENING OF GREY POWER SCHEME.—The new hydro-electric works constructed for the Grey Electric Power Board on the Arnold River, 17½ miles from Greymouth, has now been put into commission. The scheme, which has cost £118,000, replaces an old steam plant which had become inadequate.

Northern Ireland.—PROGRESS OF ELECTRICITY SCHEME.—Several additional towns and villages in the Six Counties have intimated a desire to be included in the Northern Ireland Electricity Scheme. While the original scheme is far advanced, the additions to be made will carry the work well into next year.

Oswestry.—MAINS EXTENSION.—The Town Council has received sanction to the borrowing of £7,000 for the extension of mains, &c.

Otley.—ELECTRICITY FOR HOUSING ESTATE.—The Housing Committee has given permission to forty tenants on the Council's housing estate to install electricity at their own expense.

Portgordon (Banffshire).—PROSPECTS OF A SUPPLY.—The Grampian Electricity Supply Co. is investigating the possibility of supplying electricity to the fishing town of Portgordon.

Russia.—INCREASING OUTPUT.—*Reuter's Trade Service* learns from Moscow that the power stations under the control of the Glavenergo produced in September the greatest amount of power for any month this year—729,400,000 kWh, although the monthly plan was only fulfilled to the extent of 73.6 per cent. For the first ten months of the year 6,436,900,000 kWh was produced, or 37 per cent. more than for the corresponding period of last year. The capacity of the Glavenergo stations has increased during the last ten months by 46 per cent.

Salford.—ADDITIONAL POWERS SOUGHT.—The Corporation is including in its new Parliamentary Bill a clause with reference to the electricity undertaking, providing for additional powers for cutting off supplies for non-payment of charges, the recovery of expenses of cutting off supplies, the acquisition of sites for stations for transforming and other purposes, and the filling up of statements of accounts.

Seaham Harbour.—ELECTRICITY DEPARTMENT CRITICISED.—The issue of free electric irons by the Urban District Council is criticised by the assistant district auditor in his report on the Council's accounts for the year ended last March. "Free issues to consumers of electric irons," he says, "to the value of £434 and lamps to the value of £83 were made during the year. There appears to be no lawful authority for this procedure." The loss on the net revenue account was, he adds, wholly due to this cause and the expenditure on the new showroom.

Sheffield.—STREET LIGHTING.—The City Council has rescinded a resolution in favour of an extended system of electric street lighting, which, it was stated, would have involved an outlay of £30,000. The whole question of street lighting is to be investigated.

Short Heath (Staffs).—NEW AGREEMENT.—The Urban District Council has approved the new agreement between the Midland Electric Corporation for Power Distribution and local authorities in the district. The Corporation is to be given an extension of the tenure for forty years, and prices are to be reduced by about ten per cent.

Shrewsbury.—MAINS AND SERVICES.—The Town Council is to apply for sanction to the borrowing of £10,000 for the extensions of mains and services.

Stanhope (Durham).—ELECTRICITY FOR UPPER WEARDALE.—After repeatedly turning down the scheme on grounds of national economy the Minister of Health has sanctioned the borrowing of £1,400 for the electric lighting of Crawleyside, Eastgate, Westgate, Daddry Shields, St. John's Chapel, Treshopeburn, Wearhead and Cowshill in Upper Weardale.

Stow-on-the-Wold.—PUBLIC LIGHTING.—The Urban District Council has accepted the quotation of the Shropshire, Worcestershire and Staffordshire Electric Power Co. for public lighting on the housing estate at Evesham Road.

Thurlstone (Yorks).—FINANCIAL ASSISTANCE REQUIRED.—The Electrical Distribution of Yorkshire, Ltd., has informed the Urban District Council that to extend cables to Millhouse Green would involve an expenditure of £2,550, and in view of the small return likely to be obtained the extension could not be undertaken unless the Council contributed £1,200. The Council has appointed a committee to consider the matter.

Torquay.—CONSUMERS' DEPARTMENT TO BE ORGANISED.—At a recent meeting of the Electricity Committee the engineer referred to the present unsatisfactory position with regard to the Department's service to consumers, particularly in the urban and rural areas, and stressed the desirability of making arrangements to introduce to existing and prospective consumers the many advantages available from a supply of electrical energy. Recommendations were made with regard to the organisation of a consumers' department, and it was decided that a consumers' engineer should be appointed at a commencing salary of £350 a year, with a car allowance of £100.

Tunbridge Wells.—EXTENSIONS.—The Town Council has applied for sanction to a loan of £17,958 for the extension of e.h.p. cables, switchgear, &c.

ASSISTED WIRING.—The borough electrical engineer has arranged with the local branch of the Electrical Contractors' Association for amended prices for wiring houses under the assisted scheme, and the new charges are in several instances much lower. The scheme will now apply to any size and type of property which is not less than a year old.

A Siemens' lamp and radio battery display in a registered electrical contractor's window

Wallasey.—FEEDER RECONSTRUCTION SCHEME.—A scheme for the reconstruction of e.h.p. feeder cables in the Dock Road area, necessitating two additional cables and a new switching station and sub-station, has been approved, and tenders are to be invited.

West Hartlepool.—REBATE FOR CONSUMERS.—The Town Council has decided to allow consumers a 7½ per cent. bonus in addition to the usual discount off their accounts for the last quarter of the year. Prepayment meter consumers are to receive a rebate of 1d. in the 1s.

Whitehaven.—LOANS.—The Town Council has applied for sanction to loans of £2,500 for mains and £1,800 for an 11-kV overhead line between the sub-station at Hensingham Road and Seacliff.

Winchester.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at Twyford and Shawford.

York.—SUPPLY TO TERRINGTON.—The Electricity Committee proposes to apply for sanction to a loan of £2,013 to supply electricity to Terrington.

Traction

Algeria.—RAILWAY ELECTRIFICATION.—The Algerian State Railway authorities, who have already electrified the 67-mile line between Duvivier and Ould Kebeut, are preparing plans for the electrification of the Algiers-Constantine, Bone-Duvivier, and Ould Kebeut-Tebessa lines.

Australia.—TRAMWAY EXTENSIONS URGED.—A conference held at Coburg, which included representatives of the City Council, decided to seek an interview with the Melbourne Tramways Board to urge the carrying out of tramway extensions as early as possible as unemployment relief works.

Birmingham.—ELECTRIC HEATING OF TRAMCARS.—An interesting experiment in connection with the heating of tramcars is being carried out in Birmingham. One of the bogie type of cars has had a tubular electric system installed, and for the last few weeks has been running on the Stratford Road and Warwick Road routes. Another vehicle is at present being similarly equipped, and there will be a wider application of the system if the experiment is a success.

Dover.—COST OF TROLLEY-BUS SCHEME.—The Town Council has received estimates of the cost of the proposed trolley-bus scheme which amount to £58,500, comprising rolling stock (£40,000), overhead equipment (£16,500), and feeder cables (£2,000). In addition there are road charges, and £20,100 for a garage, workshops, offices, &c.

Italy.—NEW ELECTRIC RAILWAY.—Plans are being prepared for a new electric railway between Forli, Ravenna and Porto Corsini.

Japan.—NEW ELECTRIC RAILWAY COMPANY FORMED.—It is reported that the Ujigawa Electric Co. is to transfer its electric railway business to a new company to be formed under the title of the Sanyo Electric Railway Co. This company will have a share capital of 30,000,000 yen, practically all of which will be held by the Ujigawa Co.

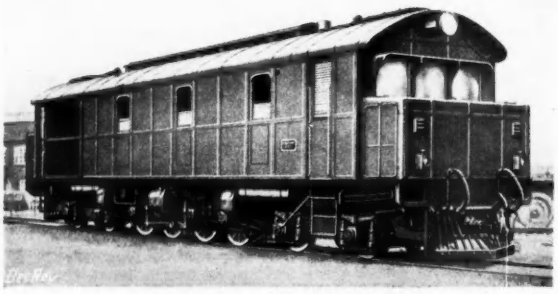
Leicester.—TROLLEY-BUS REPORT.—A report relating to the proposed introduction of trolley-buses on the Melbourne Road route is to be placed before the Tramways Committee shortly.

London.—THE AMBER LIGHT TO GO?—In accordance with the practice in certain American cities, the Minister of Transport has arranged for the discontinuance, experimentally, of the use of the amber lights in the automatic traffic control systems along Oxford Street and at the junction of Sloane Street and Pont Street, Chelsea.

ST. MARYLEBONE.—The Works Committee recommends the extension of the automatic traffic control system in the borough at a cost of £10,766.

Norwich.—SALE OF TRAMWAYS.—A provisional agreement for the purchase of the tramways by the Corporation has been approved by the Norwich Electric Tramways Co.

Siam.—DIESEL-ELECTRIC LOCOMOTIVES.—In addition to the six 450-h.p. Sulzer locomotives delivered at the end of last year, six 900-h.p. locomotives for express trains and seven further locomotives and motor coaches supplied by the Frichs Locomotive and Machine Works of Aarhus, Denmark, have recently been put in service on the system of the Royal State Railways of Siam. The Frichs Co., acting as main contractors, built the Diesel engines as well as the mechanical part of the locomotives, while the electrical equipment was supplied by the Oerlikon Company. The 900-h.p. locomotives differ mainly from the 450-h.p. machines in that the Diesel-



A Diesel-electric locomotive for Siam

electrical equipment is divided into two units, each of 450-h.p., with four central driving axles and a four-wheel bogie at each end. Each Diesel-electric set works in conjunction with two axles which are driven by standard motors arranged for nose suspension. The load is adjusted by running either both or only one Diesel engine set, and by altering the speed of the Diesel engine in three steps. The weight of each locomotive is only about 86 tons, and the frame is only 46 ft. long. The locomotives have to haul passenger as well as express trains with a total weight of 500 tons over a distance of 1,200 miles without renewing the fuel supply. The continuous tractive effort at the wheel rims amounts to 8,000 lb. at 30.4 m.p.h.; at a maximum speed of 37.2 m.p.h. the locomotives are capable of developing continuously a tractive effort of 6,400 lb.

Spain.—RAILWAY ELECTRIFICATION PROPOSAL.—The electrification of the Madrid-Avila and Madrid-Segovia railway lines is again being discussed, reports a *Reuter's Trade Service* correspondent from Madrid. About 175 km. of line is affected by these proposals.

UNDERGROUND STATION FOR MADRID.—A plan for the construction of an underground station in the heart of Madrid, to serve all railways touching the capital, has been approved by a conference of prominent engineers and government officials.—*Reuter* (Madrid).

Stalybridge.—TROLLEY-BUSES.—The Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board proposes to seek permission to run trolley-bus services.

Sweden.—ELECTRIFICATION PROGRESS.—Electrification work will soon be completed on the Falköping-Naessjö line, 113 km. long, which connects the Gothenburg-Stockholm and Stockholm-Malmö main lines. The new line will probably be opened to traffic about the middle of December.—*Reuter's Trade Service* (Stockholm).

Communications

Australia.—NEW BROADCASTING STATIONS.—The Australian Postmaster-General states that it is proposed to erect new regional broadcasting stations in all the States except South Australia. Engineers are now choosing the sites, and when these are decided upon tenders will be called for immediately.

Fleetwood.—RADIO SETS AND THE CHANGE-OVER.—The dispute with the Urban District Council regarding the conversion of radio sets following the change-over from d.c. to a.c. has gone a step further. The Ratepayers' Association recently wrote to the Electricity Commissioners asking for a ruling on the question. A reply has now been received from the Commissioners, stating that they are communicating with the Council on the matter and will keep the Association informed of any developments.

Great Britain.—RECORD MONTHLY LICENCE TOTAL.—A record number of licences was taken out during October, the total being approximately 784,000—144,000 more than in any previous month. This number includes renewals, but the large increase is attributed to the campaign initiated by the Post Office on October 10th to trace unlicensed radio receivers.

RADIO EXCHANGES.—Great Yarmouth Council is to allow the establishment of a radio relay service for the borough, although there was opposition on the ground that it would adversely affect the trade of local radio dealers.

The East Sussex County Council has refused an application by the Edward Prior Electric Co., Ltd., for permission to erect overhead wires across county roads for a relay service at Lewes. The Lewes Town Council has taken a similar course.

New Zealand.—LICENCES.—The latest statistics show that 74,812 broadcast receiving licences have now been taken out in New Zealand.

South Africa.—TELEPHONE AND TELEGRAPH DEVELOPMENTS.—The recent annual report of the Union Postmaster-General refers to the important improvements which are now being made to the long-distance telephone and telegraph systems of South Africa. The carrier currents system of transmission has proved very successful and an additional telephone carrier has been installed between Bloemfontein and Aliwal North, similar systems being in course of installation between other points. The question of extending the use of carrier equipment on a large scale has been investigated, and there appears to be every justification for the adoption of a very comprehensive network.

LICENCES.—*World Radio* states that during the year ended March last the number of licensed broadcast listeners in the Union of South Africa rose from 28,109 to 42,487. This increase of 14,378 licences in one year is the greatest on record. At present there are five licensed broadcasting stations.

RADIO-TELEPHONE SERVICE EXTENDED.—The radio-telephone service to South Africa has now been made available to Durban.

Spain.—THE RADIO-TELEGRAPH CONVENTION.—At the International Radio-Telegraph Convention at Madrid an agreement has been reached for the extension of the range of wavelengths allotted to civil aviation from 850-950 metres to 830-980 metres.

United States.—TELEPHONE INCOME DECLINES.—The *Electrical World* states that an operating income of $150,899,851 is reported by 103 telephone companies for the eight months ended August 31st. This total compares with $185,593,992 in the corresponding period of 1931. Gross revenues were $703,053,403, against $777,893,241.

The Generation of Electricity in October

The official returns rendered to the Electricity Commissioners show that 1,098 million kWh was generated by authorised undertakings in Great Britain during October, as compared with the revised figure of 1,037 million kWh in the corresponding month of 1931, or an increase of nearly 5.9 per cent.

During the first ten months of 1932 up to the end of October the total amount generated by authorised undertakings was 9,730 million kWh, as compared with the revised figure of 9,095 million kWh for the corresponding period of 1931, representing an increase of 635 million kWh or nearly 7 per cent.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—January 10th. Post and Telegraph Department. Telephone jacks and number plates (A.X. 11580)* and loading coil pots (A.X. 11578).*
January 17th. Switchboard keys and parts (A.X. 11582)* and telephone bells and parts (A.X. 11583).*

Bridgwater.—November 28th. Corporation. Pumping machinery. Mr. E. A. Sandford Fawcett, 53, Victoria Street, S.W.1. (Deposit £5 5s.)

Dumfries.—November 29th. County Council. Switchboards for Dumfries, Annan and Lockerbie sub-stations. (See this issue.)

Dundee.—November 21st. Housing Department. Electric lighting installation at thirty-six tenement houses. City quantity surveyor, 91, Commercial Street.

Easington (Co. Durham).—R.D.C. Wiring of 200 houses on various sites. Mr. J. Wilson Hayes, architect, Central Chambers, Wingate, Durham.

Egypt.—CAIRO.—December 17th. Ministry of the Interior. Overhead and underground distribution network for the town of Fikria. (A.X. 11552.)*

London.—November 28th. L.C.C. Tramway track, guard rails, tee rails, &c. General manager, L.C.C. Tramways, 23, Belvedere Road, S.E.1 (deposit £2).
ISLINGTON.—December 9th. Electricity Department. Mains extensions. (See this issue.)

New Zealand.—WELLINGTON.— — January 10th. Post and Telegraph Department. 10,000 telephone transmitters. (A.X. 11587.)*

Northern Ireland.—BANGOR (CO. DOWN).—December 12th. Town Council. Electrically driven pumping plant. Messrs. John Taylor & Sons, Caxton House, S.W.1 (deposit £5).
BELFAST.—December 5th. City Council. Electrically driven pump, with switchgear, &c. City Surveyor's Department.

Oban.—December 9th. Electricity Department. Generating station 11-kV switchgear. (See this issue.)

Rochdale.—December 1st. Electricity Department. Meters (see this issue).

South Africa.—JOHANNESBURG.—December 19th. South African Railways and Harbours. Manual telephone exchange for Durban. (A.X. 11558.)*

Walsall.—November 24th. Electric Supply Department. E.h.p. and l.p. cable. (November 11th.)

West Midlands.—December 9th. Joint Electricity Authority. Static step-down transforming plant for the Ocker Hill generating station. (November 11th.)

Whitehaven.—Electric Supply Department. E.h.p. overhead line. (November 11th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bangor (NORTH WALES).—Electricity Committee. Accepted. Wiring of houses on the hire-purchase system.—Owen & Palmer.

Glasgow.—Corporation Electricity Committee. Accepted. Sixteen 400-kVA transformers (£2,544).—Bruce Peebles & Co., Ltd. Four 800-kVA transformers (£1,136).—Brush Electrical Engineering Co., Ltd.
It was reported to the Corporation Cleansing Committee in connection with the offers received for the installation of the electric lighting and battery charging plant in the extended garage at Govan refuse power works that an amended offer made by Messrs. Wylie & Lochhead, Ltd., is the lowest. It was agreed that the amended offer be not accepted, but that Messrs. Wylie & Lochhead, Ltd., be given an opportunity of carrying out the work at the prices quoted by them in their original offer, amounting to £282, and that in the event of the company not agreeing to proceed with the work on that condition, the offer by Harland & Wolff, Ltd., amounting to £314, be accepted.

Ipswich.—Public Assistance Committee. Accepted. Internal telephones at institution (£101).—Martin & Newby.

Portsmouth.—Electricity Committee. Accepted. Battery booster (£419).—Lancashire Dynamo & Crypto, Ltd.

Salford.—Town Council. Accepted. Installation of electric lighting and heating at new police station (£69).—H. Quarmby.

Teesdale.—Education Committee. Accepted. Installation of electric lighting at Barnard Castle Council School (£60).—William Sykes & Sons.

Weymouth.—Electricity Committee. Accepted. Cable (£1,701).—District Transmission Lines, Ltd. Kiosk (£399).—Standard Switchgear, Ltd.

Woodford.—Highways Committee. Recommended. Traffic signals (£440).—Automatic Electric Co., Ltd.

Forthcoming Events

Electrical Trades Benevolent Institution.—Friday, November 18th. Grosvenor House, Park Lane, W. 8.30 p.m. Electrical Industry Ball.

Overhead Lines Association.—Friday, November 18th. Georgian Restaurant, Harrods, Knightsbridge. 5 p.m. Annual conversazione.

Institution of Electrical Engineers.—Monday, November 21st. Institution, London. 7 p.m. Informal meeting. Discussion on "Loud Speakers." Opened by Dr. N. W. McLachlan. (*Mersey and North Wales (Liverpool) Centre*).—Monday, November 21st. University, Liverpool. 7 p.m. "The Inland Telegraph Service—The Introduction of Modern Machinery and Methods." Mr. R. P. Smith. (*South Midland Centre*).—Monday, November 21st. University, Birmingham. 7 p.m. "The Electric Lighting of Buildings." Messrs. A. B. Read and J. W. T. Walsh. Friday, November 25th. Grand Hotel, Birmingham. 7 p.m. Annual dinner. (*Tees-side Sub-Centre*).—Monday, November 21st. Cleveland Technical Institute, Middlesbrough. 7 p.m. "The Relative Fuel Economy of Electricity, Gas, Oil and Solid Fuel as Heating Agents." Mr. A. H. Barker. (*North-Eastern Centre*).—Monday, November 21st. Carliol House, Newcastle-on-Tyne. 7 p.m. Informal meeting. Film illustrating the Modern Electrified Colliery, preceded by address on "Mining and the Electrical Engineer," by Mr. S. Burns. (*North Midland Centre*).—Tuesday, November 22nd. Hotel Metropole, Leeds. 7 p.m. "The Design of a Distribution System in a Rural Area." Messrs. E. W. Dickinson and H. W. Grimmitt. (*Scottish Centre*).—Tuesday, November 22nd. Grosvenor Restaurant, Glasgow. 6.30 for 7 p.m. Annual dinner. (*London Students' Section*).—Tuesday, November 22nd. Institution, London. 6.15 p.m. Joint meeting with I.C.E. and I.P.O.E.E. "Modern Systems of Electrical Installation for Large Buildings." Mr. R. C. W. Joyce. (*South Midland Students' Section*).—Tuesday, November 22nd. University, Birmingham. 7 p.m. "Some Applications of Automatic Control Gear to the Starting of a.c. and d.c. Motors." Mr. W. Hime. (*North-Western Students' Section*).—Tuesday, November 22nd. Engineers' Club, Manchester. 7.15 p.m. Students' lecture, "Switchgear." Dr. C. C. Garrard. (*North-Eastern Students' Section*).—Friday, November 25th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Address by Mr. C. Turnbull.

Electrical Power Engineers' Association (London Technical Group).—Tuesday, November 22nd. Junior Institution of Engineers, London, 7.15 p.m. "Modern Alternators—Design and Manufacture." Mr. A. D. Sloan.

Illuminating Engineering Society.—Tuesday, November 22nd. 6 p.m. Visit to the Building Centre, Ltd., New Bond Street, W.

Cardiff Engineering Exhibition.—November 23rd-December 3rd. Grey Friars Hall, Cardiff.

Edinburgh Electrical Society.—Thursday, November 24th. Plaza, Edinburgh. Annual whist drive and dance.

Association of Supervising Electrical Engineers.—Thursday, November 24th. Grand Hotel, Bristol. 7.30 p.m. "The Grid Applied to Business and Domestic Purposes." Mr. J. W. Beauchamp.

Birmingham Electric Club.—Friday, November 25th. Grand Hotel, Birmingham. 7 p.m. "Review of Modern Power Station Design." Mr. T. E. Boothby.

Chartered Institute of Patent Agents.—Friday, November 25th. Institution of Mechanical Engineers, London. 3.45 p.m. 50th anniversary meeting.

British Electrical Development Association.—Friday, November 25th. Caxton Hall, Westminster, S.W. 7.30 p.m. Two anonymous papers on "Electric Cooking."

Association of Mining Electrical Engineers.—Saturday, November 26th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Notes on Repairing Trailing Cables." Mr. Ll. B. Atkinson.

The Castle Harbour Hotel, Bermuda: An excellent example of G.E.C. lighting

Notes

Remarkable Recording

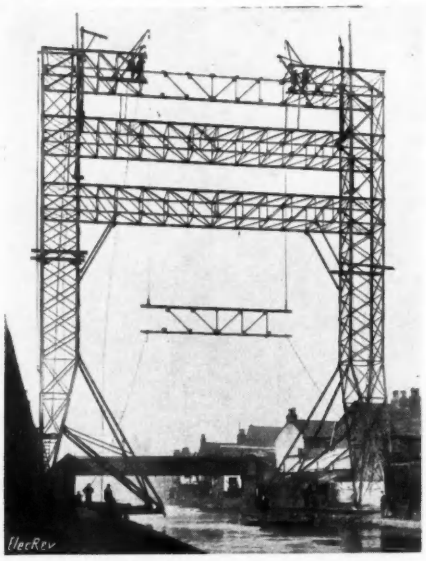
The Gramophone Company has developed a process by means of which it has taken a Caruso record originally made in 1903 in the early days of horn recording, and after producing from the waves in the wax minute electric currents, have passed the latter through filters which correct the deficiencies in the original recording; thus a new wax master is made of the original performance. A new orchestral accompaniment was provided and the record was played through for re-recording, the conductor listening by means of headphones and simultaneously directing his orchestra.

Prior to the advent of electrical recording in 1925 records were made by the artist performing in front of a horn, and only a fraction of the range of the voice was recorded in its true perspective. The new process will enable the voices of artists recorded thirty years ago to be heard as if recorded to-day.

The Grid at Liverpool

One of the most interesting primary lines of the grid is the double-circuit route leading into Liverpool along the Leeds and Liverpool Canal. For a length of 4½ miles the conductors have to be supported on gantries which straddle the canal. These gantries have three horizontal members, each of which carries two 37/.110-in. steel-cored aluminium conductors, while a 19/.110-in. overhead earth wire is carried on an extension piece over the top member. Each structure is designed to withstand completely broken-wire conditions in either direction.

Our illustration shows a gantry in course of erection. Temporary struts are employed to support the vertical members until the first horizontal member has been bolted into position; the outer end of the strut is supported on a pontoon, leaving a clear fairway for barges. Considerable difficulty with the foundations has been encountered owing to running sand, and in such instances reinforced concrete piling has had to be used to ensure stability. The principal contractors for the work are British Insulated Cables, Ltd.



Gantries to carry the grid lines along the Leeds and Liverpool Canal

Electricity in Coventry Theatres

At a meeting of the Electricity Committee of the Coventry City Council the Town Clerk reported that the Watch Committee had decided (subject to the concurrence of the Electricity Committee with regard to the services of the Electricity Department staff) not in future to issue certificates as to the adequacy of means of egress from kinemas and theatres until all electrical installations had been tested and passed. The Electricity Committee decided not to object to the electrical engineer arranging for inspections and to his presenting reports upon them to the Watch Committee, on the understanding that the Electricity Department was involved in no responsibility in consequence.

Micro-ray Communication

A "Micro-ray" equipment giving radio communication on the shortest wavelength employed at any radio station in the world has been ordered by the Air Ministry for use in connection with cross-channel flying services. This equipment will be manufactured by Standard Telephones & Cables, Ltd., in their Hendon factory. Some eighteen months ago the first demonstration of practical radio telephony on a wavelength of 18 cm. was given by the International Telephone & Telegraph Laboratories of Hendon. The equipment now ordered will operate on a wavelength of about 15 cm., with transmitting and receiving aerials less than one inch long. Micro-rays at about 2,000,000,000 oscillations a second, generated in a "Micro-Radion" tube, are led to the transmitting aerial and are then concentrated by a combination of mirrors into a fine pencil of rays, which are thrown into space from a circular reflector, about 10 ft. in diameter. This reflector is focused on to a similar reflector at the receiving station.

The equipment will be situated at Lympne, and will operate in conjunction with a similar equipment of the French Air Ministry at St. Inglevert aerodrome. It will be used for announcing the arrival and departure of aeroplanes that are not fitted with radio, and for routine service messages. It is expected that the station will be in operation early next spring.

Removing Tree Stumps Electrically

The British Columbia Railway Co. has recently formed an agricultural and horticultural department, which has since its inauguration been conducting demonstrations of the use of electricity for removing tree stumps from farm land. The system, which has been successfully applied to stumps of trees felled from 20 to 35 years ago, consists in the creation of a draught by electrically driven blowers. Though somewhat slower in operation than the usual method of blasting with explosives, it is far cheaper and less dangerous.

Holes from 10 to 30 in. deep are drilled electrically into the large roots of the stump close to the surface of the ground, the auger being pointed towards the centre of the stump; one hole is bored in each large root, penetrating the wet outer layer of wood; the deeper the holes the quicker the fires will be united in the centre of the stump. The fires will be united about three hours sooner with 30-in. than with 6-in. holes. The best results with the average 6-ft. stump are obtained by drilling seven or eight holes not being farther apart than 3 ft.; four or five main holes bored in the thickest part of the stump should be connected with the smaller holes before the fires are united. The holes are filled about three-quarters full with old crank-case oil and a tablespoonful of petrol is added. Stakes driven into the ground give the proper slant to the pipes, and when the oil has been ignited the hole is covered with dry bark.

The motor is then started, and the air gradually applied. The wood is dried enough to burn well and the pipes are hot enough to maintain the fires for from 10 to 15 minutes.

Standard Specification for Cranes

The recent issue of a British Standard Specification for Electric Overhead Travelling Cranes is an event of importance to users of such appliances in constructional work, warehouses, factories, foundries, and engineering workshops. This specification is one of a series issued for cranes and derricks. It provides for cranes power driven in all motions of spans up to 80 ft. and load capacities up to 70 tons, suitable for normal service. In general a factor of safety of five has been adopted, but higher factors are recommended, with proportionately lower working stresses, for cranes intended for duty of great severity. No attempt has been made to deal with cranes from the dimensional or size standpoint, although in other respects the specification is drawn on very comprehensive lines. Separate sections are devoted to motors, controllers, cables, and protective gear. Copies of this specification (B.S.S. No. 466-1932) can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Marvellous Lamps

Mr. Basil Tozer's "Confidence Crooks and Blackmailers," published by Laurie at 7s. 6d., deals with a variety of swindles, one of the coolest of which is described by Mr. Tozer as the "electric bulbs hoax." The crook pulls up in a car outside a shop and the driver says he wants to show the shopkeeper an entirely new type of lamp. He says they are manufactured abroad and he has the first consignment which he is offering cheap. He detaches a bulb from its socket and places one of his own in position, and at once the room is brilliantly illuminated. The price is little more than that of ordinary lamps, and if the shopkeeper is unwary he will make a purchase. The caller asks for an open cheque as he has but just arrived in England.

After he has gone the shopkeeper removes his old lamps and attaches the new ones, and for perhaps an hour his shop is a blaze of light, and then the lights go out. The marvellous new lamps are nothing but ordinary ones for a lower voltage. Mr. Tozer says that in one street alone in London one of these crooks raised over a hundred pounds in this way.

Appointments Vacant

Two assistant shift charge engineers for the Shanghai Power Co.

Consumers' engineer for Torquay Electricity Department.

(See our advertisement pages to-day.)

Neon Aircraft Lights at Croydon

An experimental installation of neon lighting for the assistance of airmen while landing at night or at other times of bad visibility has just been completed at Croydon Aerodrome. Twenty-eight neon tubes operating at 1,000 V have been installed below the level of the ground in the form of an "I" about 300 yards in length. The lights are not in continuous lines but are broken at intervals, there being forty feet between each section. Pictures of the installation appear on page 747.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

CLIMAX piston pumps.

Lamps with magnetic bases which adhere on to steel columns of machine tables when switched on.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. C. F. Currington, of Wolverhampton, has been appointed showroom assistant at Twickenham by the London and Home Counties Joint Electricity Authority.

[*Elliott & Fry*

Mr. P. N. Rand

The agreement between the English Electric Co., Ltd., and **Mr. P. N. Rand,** M.I.E.E., general sales manager, having expired, Mr. Rand has intimated his intention not to renew it. His connection with the English Electric Co. will therefore terminate at the end of November, when he hopes to enjoy a much belated holiday before taking up other activities. Personal letters for Mr. Rand should be addressed c/o the Royal Automobile Club, Pall Mall, S.W.

Mr. H. C. Siddeley, M.I.E.E., the B.E.A.M.A. delegate at Buenos Aires, has been satisfying a very pronounced thirst that exists in the Argentine for information regarding the origin and development of Britain's grid system. He read a paper on "The Organisation of the British Electrical Industry and the Working of the Grid System" at the Buenos Aires branch of the I.E.E. on October 21st, and three days later followed it with a paper on "The Grid System" before the Centro Nacional de Ingenieros, the leading association of Argentine engineers.

Mr. Cecil Ridley, of Middlesbrough, a well-known North-East Coast electrical and radio wholesaler

Mr. C. B. Unwin, A.M.Inst.C.E., formerly of the English Electric Co., Ltd., has been appointed assistant general manager to Messrs. Kryn & Lahy (1928), Ltd., Letchworth.

Mr. W. Luff, commercial manager, Yorkshire (West Riding) Electric Tramways Co., Ltd., has been appointed general manager of the Blackpool Transport Department.

Mr. William Reavell, managing director of Messrs. Reavell & Co., Ltd., and a past-president of the Institution of Mechanical Engineers, has been re-elected president of the British Engineers' Association.

Mr. W. N. Drew, Lt.-Col. H. W. Woodall, and **Sir Samuel Roberts** have joined the board of the Wellman Smith Owen Engineering Corporation.

New J.I.E. Officers.—At the annual general meeting of the Junior Institution of Engineers, held on November 11th, the following officers were elected: Chairman, Mr. E. Ambrose, M.I.E.E.; vice-chairmen, Messrs. A. E. Bingham and H. P. Wright; hon. editor, Mr. C. E. Atkinson; hon. treasurer, Mr. W. M. Hurrell; hon. librarian, Mr. F. Squirrell; senior councillors, Messrs. A. P. Morris, H. J. N. Riddle, and G. H. Willett; junior councillor, Mr. W. Wood.

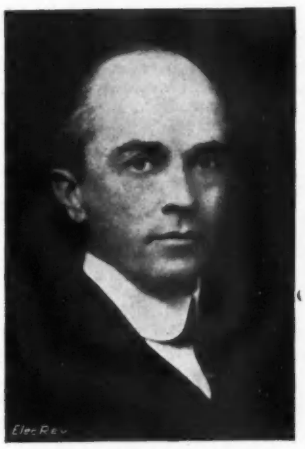
Mr. Guy Campbell, who is chairman of several electrical, radio and automobile companies was recently presented, at a luncheon at the Savoy Hotel, with a portrait of himself in oils executed by Mr. George Harcourt, R.A. The donors of the portrait were his co-directors and it was presented by Mr. W. T. Robinson.

Mr. R. P. Smith, who read a paper on "The Inland Telegraph Service" at last night's meeting of the Institution of Electrical Engineers. **(See p. 744)**

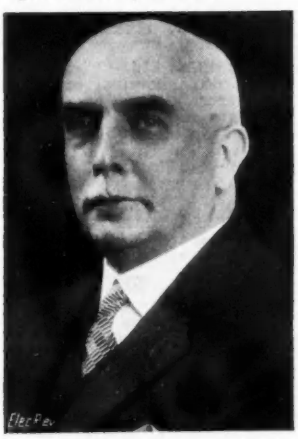
Mr. W. C. Lusk, deputy chairman of Associated Electrical Industries, Ltd., has been appointed managing director of the company.

Ex-Bailie David Orr, Kilmarnock, has been appointed chairman of the Ayrshire Electricity Board in place of **ex-Provost Mathew Smith** (retired), and **Bailie R. Scott** has been appointed vice-chairman.

Mr. G. Holmes and **Mr. J. Pallister,** who are retiring from the staff of the Burnley Corporation Tramway Department, received presentations on November 11th from their colleagues through Mr. C. H. Stafford, the new manager of the department.



Mr. W. C. Lusk



[*Spearman*

Mr. R. G. Rawkins

Mr. R. G. Rawkins, J.P., a director and manager and secretary of the Notting Hill Electric Lighting Co., Ltd., and chairman of the London Electricity Supply Association, has been elected Mayor of Windsor for the second time, having previously served in this office in the year 1920. He has also been elected an Alderman of the Royal Borough.

In our last issue we incorrectly referred to **Mr. H. H. Spencer** as president of the Association of Mining Electrical Engineers. We are now informed that Mr. Spencer is president of the London branch, and that **Mr. F. Beckett,** of Glasgow, is the president of the Association for 1932-33.

Mr. James Scott, electrical engineer to the West Lancashire Rural District Council and to the Formby Urban District Council, has been elected Mayor of Bootle.

Obituary

Sir Dugald Clerk.—We regret to record the death, which occurred on November 12th, in his seventy-ninth year, of Sir Dugald Clerk, a director of the National Gas Engine Co., Ltd., who was so well known for his researches in connection with the internal combustion engine. Educated at the West of Scotland Technical College and the Yorkshire College of Science, Leeds, he joined Messrs. Thomson, Sterne & Co., Glasgow, in 1877, with whom he began to experiment on the gas engine, and in 1881 he invented the Clerk two-cycle gas engine. In 1882 he was awarded a Watt Medal and the Telford Premium for a paper on "The Theory of the Gas Engine," which he read before the Institution of Civil Engineers. He joined Tangyes, Ltd., in 1886, and in 1888 began to practice in Birmingham as a consulting engineer. In 1892 he joined the board of Kynoch, Ltd., as engineering director, and while with this company studied ammunition manufacture. In addition to consulting work, he practised as a patent expert. His inventions included the flame self-starter for gas engines. He was

Int. Rotogravure

The late Sir Dugald Clerk

elected a Fellow of the Royal Society in 1908 and received a Royal Medal in 1924. He was past-president of a number of societies and institutions, including the Junior Institution of Engineers, and he was a frequent attendant at the meetings of the British Association, of the Engineering Section of which he was chairman for one year. He was elected president for this year of the Institution of Civil Engineers, but was prevented by ill-health from taking office. He was created K.B.E. in 1917. Sir Dugald was the author of numerous papers, and his books on gas and petrol engines are standard works. The interment took place on November 15th at Ewhurst.

Mr. P. B. Smith.—The death occurred on November 9th, at the age of 45 years, of Mr. Percy B. Smith, who had been representative of Messrs. Home and Rowland, Charlton, since 1912 except for three years' war service.

Mr. R. B. Hungerford.—We regret to announce the death on November 3rd of Mr. R. B. Hungerford, managing director of Standard Telephones & Cables (Australasia), Ltd. In June last Mr. Hungerford was ordered a complete rest, owing to heart trouble, but the treatment failed to bring about any permanent improvement in his health. He left England about 30 years ago to take up his Australian appointment. Since then the company, with a head office at Sydney and branches at Melbourne and Wellington, has been under his control.

Capt. T. W. Smythe.—The death is reported of Capt. Theodore William Smythe, O.B.E., of the Eastern Telegraph Co., which occurred at Caxton, Crownhill, Devon, on November 13th.

Will.—Mr. Alfred Henry Darker, of Queensland, formerly chief electrical engineer of Messrs. J. Stone & Co., Deptford, S.E., left £15,433 in England.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Mayer & Co. (1932), Ltd.—Private company. Registered November 14th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical, wireless, mechanical and general engineers, &c. The subscribers are: E. T. Mayer, 19, Broad Street, Barry, Glam, and T. B. Whitelaw, 12, Charles Place, Barry. Secretary (pro tem.): E. T. Mayer. Solicitors: Davies & Prichard, 3, Edward Terrace, Cardiff.

West African Electrical Development Co., Ltd.—Private company. Registered November 12th, with a nominal capital of £100 in £1 shares. Objects: To prospect, explore and investigate the industrial and electric power supply of West Africa and elsewhere, &c. The first directors are: Col. C. de W. Crookshank, Sir Sven W. Hansen, Bt., and H. W. Darbishire. Secretary: A. D. Dean. Registered office: 28, Exchange Street West, Liverpool.

Metallisation, Ltd.—Private company. Registered November 11th, with a nominal capital of £60,000 in £1 shares. Objects: To acquire the business now carried on at Dudley, Worcs, as Metallisation, Ltd., to acquire any inventions relating to the coating of surfaces with metal, together with patents for the manufacture of plant, apparatus and accessories connected therewith, &c. The directors are: C. H. Barwell, Holmewood, Park Hill, Kenilworth; Sir Martin J. Melvin, St. Bernards Grange, Olton, Warwickshire, and four others. Solicitors: Hosper & Fairbairn, Dudley.

Vita-Rays, Ltd.—Private company. Registered November 7th. Capital £6,000 in 5,000 preferred ordinary shares of £1 each and 5,000 ordinary shares of 4s. each. Objects: To carry on the business of manufacturers of and dealers in electro-medical and surgical apparatus and appliances of all kinds, &c. The directors are: T. C. Stuart, 18, Emperor's Gate, Kensington, S.W.7; A. M. Mitchell, "Craiggowan," Golf Road, Ballater, Aberdeenshire; A. B. Gosling, Sunbury House, 2, Mortimer Place, N.W.6; and W. C. A. Mate, 86, Eltham Road, S.E.12. Registered office: First Avenue House, High Holborn, W.C.1.

Rose & Lewis (Brighton), Ltd.—Private company. Registered November 7th. Capital £1,000 in £1 shares. Objects: To acquire the business of electric sign manufacturers, carried on by C. A. Rose and A. E. Lewis at 42, Upper Russell Street, Brighton. The subscribers are: C. A. Rose and A. E. Lewis, both of 42, Upper Russell Street, Brighton. Secretary (pro tem.): C. A. Rose. Registered office: 42, Upper Russell Street, Brighton.

David B. Irvine (Edinburgh) Ltd.—Private company. Registered in Edinburgh, October 29th. Capital, £500 in £1 shares. Objects: To carry on the business of dealers in and agents for batteries, magnetos, dynamos and other electrical equipment, &c. The directors are: A. P. Robertson, 10, Mingarry Street, Glasgow, W., and D. B. Irvine, 684, Alexandra Parade, Glasgow. Secretary: D. B. Irvine. Registered office: Bell's Brae, Dean Bridge, Edinburgh.

Rudkin & Riley, Ltd.—Private company. Registered October 31st. Capital £500 in £1 shares. Objects: To acquire the business of manufacturing electrical engineers carried on by E. T. Riley and W. W. Warren as Rudkin & Riley at Willow Street, Leicester. The first directors are: W. W. Warren, 10, Granville Avenue, Stoneygate Rise, Oadby; and E. T. Riley, 9, Stoughton Road, Oadby. Secretary: J. C. Carr Braint, Corporation Chambers, Carts Lane, Leicester.

Taskers of Andover (1932), Ltd.—Private company. Registered October 27th. Capital, £5,000 in £1 shares. Objects: To carry on the business of mechanical, electrical, and chemical manufacturers, &c. The directors are: A. B. Fuller, Shelburne, Bishops Way, Andover, Hants, and Dr. A. L. Fuller, 9, Gay Street, Bath. Secretary: A. B. Fuller. Registered office: Waterloo Iron Works, Andover, Hants.

Wirewell Electrical and Radio Installations, Ltd.—Private company. Registered November 10th. Capital, £3,500 in £1 shares (1,000 participating preference and 2,500 ordinary). Objects: To acquire the business of electrical engineers and wireless and gramophone dealers, agents and manufacturers carried on by B. A. Singer and D. J. Singer, at 193, Mare Street, Hackney, and at 5A, The Avenue, Highams Park, E., as Wirewell Electrical & Radio Installations. The directors are: G. C. Singer, B. A. Singer, and D. J. Singer, all of 29, Castle Avenue, Highams Park, E.4. Registered office: Wirewell House, 193, Mare Street, Hackney, E.8.

Western Distributors, Ltd.—Private company. Registered November 2nd with a nominal capital of £3,100 in £1 shares (800 7½ per cent. preference, 2,000 12½ per cent. preferred ordinary, and 300 founders'). Objects: To adopt an agreement with Standard Cables & Telephones, Ltd., and to carry on the business of wireless distributors, &c. The directors are: R. A. Wright, The Hall, Kenilworth; W. G. Frogley, The Sycamores, West Bar, Banbury; and R. C. Byng, Kingsmead, Winkfield, Windsor. Secretary: R. A. Wright. Registered office: 123, Victoria Street, Bristol.

Express Radio Factors, Ltd.—Private company. Registered November 10th. Capital, £2,500 in £1 shares. Objects: To carry on the business of manufacturers of and wholesale dealers in gramophones and sound reproducing machines, electrical accumulators and batteries, wireless receiving sets, &c. The directors are: Rosa F. Hobday (chairman), Fayre Oaks, Manor Road, Chigwell; C. H. G. Hobday (managing director), Forest House, Chigwell, and J. W. S. Hobday, 32, The Drive, Ilford. Registered office: 25, Great Eastern Street, E.C.2.

J. D. Waller, Ltd.—Private company. Registered November 10th. Capital, £500 in £1 shares. Objects: To carry on business as electricians, electrical, radio and general engineers, experts and contractors, &c. The directors are: J. Sutcliffe and Miss Phyllis Sutcliffe, both of Unicorn Hotel, 14, Ivegate, Bradford.

Returns of Electrical Companies

Capel & Co., Ltd.—Satisfaction on October 6th of debenture and charge dated May 29th, 1925, and December 18th, 1929, and registered June 5th, 1925, and December 28th, 1929, respectively. (According to the register of mortgages the debenture and charge registered June 5th, 1925, and December 28th, 1929, originally secured all moneys due to bank.)

Ace Engineering Co., Ltd.—J. S. Bayfield, 22, Woodhill Crescent, Kenton, ceased to act as receiver on November 8th.

Long Eaton Cable Co., Ltd.—Particulars filed of £5,000 debentures authorised November 4th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Griffin, Harding & Bryant, Ltd.—First debenture dated November 5th, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: E. H. Hawkins, 4, Charterhouse Square, E.C.

Wireless Services, Ltd.—Issue on September 23rd of £500, and on October 17th, 1932, of £400 debentures, parts of a series already registered.

Shanghai Electric Construction Co., Ltd.—Capital, £700,000 in £1 shares. Return dated June 8th, 1932. 600,000 shares taken up. £417,000 paid. £183,000 considered as paid. Mortgages and charges, nil.

Callender's Cable & Construction Co., Ltd.—Capital, £2,300,000 in 400,000 preference, 400,000 "B" preference, and 1,500,000 ordinary shares of £1 each. Return dated June 14th, 1932. 400,000 preference, 400,000 "B" preference, and 1,160,000 ordinary shares taken up. £1,255,000 paid. £661,000 considered as paid. Mortgages and charges, £300,000.

Chiswick Electricity Supply Corporation, Ltd.—Capital, £250,000 in £1 shares (increased from £200,000 on June 2nd, 1932). Return dated March 14th, 1932. 200,000 shares taken up. £200,000 paid. Mortgages and charges, £2,967. A further 50,000 shares were allotted for cash between July 6 and August 16, 1932.

T.B.T. Electric Co., Ltd.—Capital, £2,000 in £5 shares. Return dated August 22nd, 1932. 200 shares taken up. £1,000 paid. Mortgages and charges, nil.

Sykes & Dyson, Ltd.—Capital, £6,000 in £1 shares. Return dated May 21 (filed June 29th), 1932. 5,000 shares taken up. £1,780 paid. £3,220 considered as paid. Mortgages and charges, £1,398.

Guy V. Laycock, Ltd.—Capital, £10,000 in £1 shares. Return dated July 20th, 1932. 5,200 shares taken up. £1,200 paid. £4,000 considered as paid. Mortgages and charges, nil.

All-Electric House Co., Ltd.—Letter of deposit dated October 17th, charged on leasehold house in Vicarage Road, Edgbaston, Birmingham, with fixtures, to secure all moneys due or to become due from the company to the Westminster Bank Ltd.

W. H. Porter & Co., Ltd.—Capital, £100 in £1 shares. Return dated September 22nd, 1932. 90 shares taken up. £90 paid. Mortgages and charges: £5,000.

Boston & District Electric Supply Co., Ltd.—Capital, £120,000 in £1 shares. Return dated June 2nd, 1932. All shares taken up. £120,000 paid. Mortgages and charges, nil.

Southern United Telephone Cables, Ltd.—The company's nominal capital has been increased by the addition of £49,900 in £1 ordinary shares beyond the registered capital of £100.

Campbell & Addison, Ltd.—G. H. Bond, 3, London Wall Buildings, E.C.2, ceased to act as receiver on November 1st.

Brentwood District Electric Co., Ltd.—The nominal capital has been increased by the addition of £25,000 beyond the registered capital of £55,000. The additional capital is divided into 25,000 5½ per cent. cumulative preference shares of £1 each.

Electrolumination (Abadie Proces), Ltd.—Satisfaction in full on September 28th, 1932, of debentures not exceeding £5,000 authorised October 8th, 1930, and registered December 10th, 1930.

C. N. Vernon & Co., Ltd.—T. J. Nicholas, 34, Brazenose Street, Manchester, ceased to act as receiver on November 3rd.

Higgins & Griffiths, Ltd.—Particulars filed of debentures not exceeding 30,000 authorised October 31st, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £30,000.

City Notes

Drake & Gorham, Ltd., held their annual meeting on November 8th, Mr. Hamlyn Drake (chairman) presiding. In presenting the report and accounts (ELEC. REV., November 4th, p. 693), the chairman said that a number of large contracts had been obtained. The London Department increased its turnover and still had a considerable amount of work in hand. The second section of the Bank of England was nearing completion, and would probably be handed over before Christmas. The third section would then be started and would take three to four years to complete. The 1,200-kW temporary or auxiliary generating sets were now running and supplying electricity to the Bank. The new generating plant at the head offices of the Prudential Assurance Co. was in operation. Another installation was that at the new offices of the *Daily Express*. The first section had been completed and embodied several examples of modern architectural lighting. Work would soon be started on the second section. They continued to install large industrial equipments, and recent contracts included the Worcester Park sewage works, where they had put in duplicate crude-oil generating sets and a large storage battery, in addition to the main feeders for the distribution. The Manchester branch had suffered from the general depression in the North, but a number of large contracts had been completed. The electric sign department had made further advances and the turnover was still increasing. The water-softening department was under new management, and arrangements had been made for close co-operation with the largest firm of water purification engineers in this country. Designs incorporating the latest experience of both companies had been made and a full range was now available. They were manufacturing the "Julius" totalisator for Totalisators, Ltd., and had also developed, in conjunction with the inventor, special e.h.p. switchgear for use with overhead distribution lines. Regarding the export market they had supplied switchgear for South Africa, and it was hoped that, as a result of the Ottawa Conference, still further progress would be made in the direction of Empire trade.

Electric & Musical Industries, Ltd., held its first ordinary general meeting on November 10th, when Mr. A. Clark (chairman), who presided, said that the period of 17 months covered by the accounts had seen a phenomenal increase in public interest in radio broadcasting in the British Isles. The close connection between radio and the gramophone had already brought their companies into that industry, and their rapid advances in research had resulted in modern and perfected radio receiving sets and radio-gramophones. The previous acquisition of the business and rights of Marconi's Wireless Telegraph Co. in that field placed them in a strong position, of which full advantage had been taken. The output of radio sets and radio-gramophones had now assumed very large proportions, and in order to utilise their factories on a large scale in the highly competitive electrical field they had had partly to replan and reorganise them, and the work had been carried out and completed in England in time for the present season. As to the outlook, the two companies had been organised to trade internationally. Their business was spread over most of the globe, and consequently they were linked up with the prosperity of the world, and they could not flourish and earn the profits to which they had been accustomed unless and until international trading was on a firmer basis.

Electric Development & Securities Trust, Ltd.—Returns recently made to Somerset House record increases of capital as follows: West Cambrian Power Co., Ltd., from £110,000 to £200,000; Porthcawl Electricity Co., Ltd., from £20,000 to £30,000; Monmouth Electricity Co., Ltd., from £25,000 to £35,000; South-East Yorkshire Light & Power Co., Ltd., from £100,000 to £120,000; and Wigtownshire Electricity Co., Ltd., from £30,000 to £40,000. The whole of the new share capital of these companies has been taken up by the Electric Development and Securities Trust, Ltd.

The Canadian Marconi Co. reports a loss for 1931 of $98,651, as compared with a profit of $13,441 in 1930. This is deducted from the profit and loss account, leaving $359,163 to be carried forward. On the manufacturing side of the business the volume of business done was greater, as prices were substantially lower, but profits on this branch were very small and were converted into a loss by the general price-cutting which took place in the receiving-set trade in connection with the disposal of the balance of the 1930 inventory stocks. Gross receipts on the traffic side again fell off very substantially. The negotiations with the British Post Office and the Bell Telephone Co. for the establishment of a direct transatlantic telephone service were brought to a successful conclusion, and agreements for a long-term contract have been signed. The service was establishd in July. Negotiations with Imperial & International Communications, Ltd., have been continued, but no definite result has been arrived at.

S. Smith & Sons (Motor Accessories), Ltd., report a gross profit for the year ended July 30th last of £86,833, as compared with £77,179 in the preceding year, and a net profit of £61,647 (against £53,232), to which is added £44,329 brought in, making £105,976. After providing for the preference dividend, it is proposed to pay the non-cumulative preferential dividend of 7 per cent. on the preferred ordinary shares and to write £5,000 off patents, leaving a balance of £49,476 to be carried forward. The report states that the expenses of developing the new section of the business—domestic clockmaking—have been defrayed out of revenue, and no profit is included in the accounts under review arising from the sale of these goods. This section is being developed by Smith's English Clocks, Ltd., a wholly owned subsidiary. Meeting: November 22nd.

The East African Power & Lighting Co., Ltd., has announced an interim dividend of 3 per cent., less tax (same), on the ordinary shares. According to the *Financial News* the company has placed privately 50,000 new £1 ordinary shares and 30,000 new £1 seven per cent. preference shares.

Edison Swan Cables, Ltd.—According to announcements published in the financial papers, Associated Electrical Industries, Ltd., recently purchased in the market the outstanding £237,000 5½ per cent. debenture stock of Edison Swan Cables, Ltd.

The Melbourne Electric Supply Co., Ltd., has declared a final dividend of 3¼ per cent. on the consolidated ordinary stock, making 6¼ per cent., tax free, for the year (against 7½ per cent.).

The National Gas Engine Co., Ltd., is holding an extraordinary meeting at Ashton-under-Lyne on December 7th, when a resolution will be submitted that the name of the company be changed to "The National Gas & Oil Engine Co., Ltd."

Dorman, Long & Co., Ltd., have decided not to recommend the payment of any dividend on the 6 per cent. cumulative preference shares for the year ended September 30th. The dividend on these shares is in arrear as from October 1st, 1930.

The Western Power Light & Telephone Co., a $20,000,000 corporation, has, reports the *Financial Times*, been put into the hands of a receiver owing to its inability to meet its obligations. The company will continue in operation.

Stocks and Shares

TUESDAY EVENING.

STOCK markets during the week under review were like the proverbial curate's egg—"Quite good in parts." The main interest was again centred in the gilt-edged market, but the interest was of a somewhat different character from what it has been in recent months. All the professional stags went hands down for the new Government £300,000,000 three per cent. Conversion Loan and, having got much more than they anticipated, there was an unseemly rush to unload, with the result that within 48 hours of the commencement of dealings a discount of no less than 2¾ was established—a record, one would imagine, for a British Government stock. The price subsequently hardened a bit, but even now it is no better than 1¼ discount. The whole market took its tone from this and drops were the order of the day all along the line. The downward movement is probably only temporary, as there are as yet no signs of any improvement in trade sufficient to entice money out of the gilt-edged market. The result of the Presidential Election in the U.S.A. did not have the effect on markets that some people anticipated, and after a few erratic movements the various international counters left off very much where they started, though perhaps on balance they were if anything a bit up. The Home Railway market presented a slightly less unhappy appearance upon the publication of a small increase in traffics on the part of the Southern Railway, thus breaking a dreary record of months of decreases. Undergrounds were also firm at just under 20s., but the reason here is to be found in their prospects under the Government's London Passenger Transport Bill, as their traffics continue on the down grade. Metropolitan Districts succeeded in retaining their previous rise at 65½, but Metropolitan consolidated ordinary sagged a point at 60. The Industrial market, although throwing up no particular feature, was distinctly firmer.

Active Electric Lights

The Electricity Supply market as a whole was distinctly good. Rather exceptionally, the ordinary shares of the London companies operating under the 1925 Act displayed distinct activity, and, as will be seen by our list of prices, all achieved 1s. to 2s. rises and are now all standing between 33s. and 33s. 6d. The ordinary shares of the big bulk supply companies threw up very little price movement, although there was the usual day-to-day business doing in them. North-Eastern ordinary tended to sag on the announcement of the forthcoming issue of 660,000 new ordinary shares, but afterwards recovered and ended the week where they started—i.e., at 28s. It is anticipated that immediately they are created these ordinary shares will be offered to shareholders on bonus terms. There was no change in the price of the 5 per cent. non-cumulative participating preference, but the 7 per cent. first preference were a bit higher at 31s. 6d. The high prices ruling for the various 5 per cent. debenture stocks compared with their redemption terms was inclined to restrict dealings, but somebody gave as much as

120½ for County of London Electric 5 per cent. debenture stock. Apropos of debentures, the holders of London Power 5 per cent. debenture stock will probably be interested to learn that the next drawing of this stock at 100 will not take place until late in the autumn of 1933, the company having been able to satisfy this year's sinking fund requirements by purchases under par very early last spring. The various preference shares met with the usual investment demand and there was certainly a tendency on the part of holders of the 6 per cent. preferences, such as City of Londons, Scottish Power, Yorkshires and North Metropolitans, to turn out their shares at the prices ruling—i.e., between 28s. and 29s.—and reinvesting the money in such shares as Edmundson's Electricity 6 per cent. cumulative preference at 25s. 9d., or Shropshire, Worcestershire and Staffordshire Electric 6 per cent. cumulative preference at 26s. 6d., thus increasing their income by a good 10 per cent. on security which in the opinion of the market is in every way comparable. Of the smaller concerns, the ordinaries of Cambridge Electric were seen at 33s. 6d., Mid-Cheshires at 31s. 3d., North Wales at 9s., and West Gloucestershire Power ordinary at 52, with the 5½ per cent. preference a point or so lower at 94. British Power and Light continued active round about 15s. 6d. and the 6 per cent. cumulative preference were in investment demand at 24s. 9d.

Some New Placings

Two new placings were seen last week in the market for overseas lighting shares—one was 25,000 7 per cent. cumulative preference shares of the Jerusalem Electric Company with the dividend covered twice which was on offer at 26s. free, giving a return of 5⅜ per cent., and the other was 30,000 also 7 per cent. cumulative preference shares of the East African Power Company. Here the price is 6d. higher, i.e,, 26s. 6d. free, giving a yield of just over 5¼ per cent., which is being earned on current profits four times. At the same time the East African Company placed 50,000 new ordinary shares which are available at 28s. ex the interim dividend of 3 per cent. actual which has just been announced. This interim is the same as has been paid for the last two or three years. Calcutta Supplies were rather dull at under 2½ ex the interim, but Madras Supplies at 33s. 6d. were favoured on the 8 per cent. tax free dividend which has been paid now for about ten years, and on prospects generally, the energy sales showing substantial increases over those for 1931.

Allied Trusts

Taking it altogether, there are quite a number of either trusts or holding companies in connection with the electric lighting industry, and during the last few days the majority of them seem to have put in an appearance. The biggest, of course, is the Atlas Electric and General Trust with a combined capital of over £6,000,000. Here the ordinary shares met with a certain demand and have risen to 10s. 9d. from 8s. 3d. a week or so ago, but rather exceptionally, the 7 per cent. preference shares have dropped from 23s. to 21s. 6d. The 5 per cent. debenture stock has been dealt in once or twice at 107. Bankside Investment Trust 5 per cent. debenture stock, which is guaranteed by the City of London Electric Lighting Company, changed hands at 115¼. A low-priced share which has been in demand recently is Fife Tramway Light and Power, which have risen to 13s. This is the company which is taking power to repay 5s. in the pound out of capital and to sub-divide the remaining 15s. into 5s. shares. Its main asset then will be the ordinary share capital of two tramway-cum-omnibus companies operating in Dunfermline and Falkirk, and it is anticipated that a dividend of between 3 per cent. and 4 per cent. for the current year will be forthcoming.

Traction

As will be seen from our list of prices there were practically no changes in the Home and Foreign Tramway section, and in consequence there is little or nothing to report. The companies affected by the London Passenger Transport Bill, such as London United Tramways and London and Suburban Traction, have been fairly active, and are likely to continue to be so until their fate under this Bill is known. Perhaps the most active spot, however, was Torquay Tramways ordinary at 32s. This is one of the more or less out of the way shares which seems to have been mised in the search for yields, as at this price the yield is 7½ per cent. gross on the 9 per cent. tax free dividend which has been paid for many years.

Manufacturing, Etc.

In the manufacturing section both Associated Electrical Industries and General Electrics have kept within a few pence of their quotations all the week, and with the exception of a little activity in English Electric preferences round about 13s. 9d., the others of the electrical manufacturing group were very uninteresting. As regards Cables and Wireless, although the "A" managed to retain the whole of its previous week's gain, both the "B" ordinary and the 5½ per cent. preference fell somewhat from grace, particularly the latter, which shed a couple of points at 82½ on less optimistic views as to the immediate outlook. American Telephone and Telegraph provided a feature in this section, and after somewhat hectic movements ended the week no less than 11 points to the good at 168½. Although Globe Telegraph Trust preference retained their rise of the previous week the ordinary were not so fortunate, slipping back to 11¾.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price, Nov. 15	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	71/3	—	4 4 4
Brompton Ordinary	1	8½	8½	33/–	+2/–	4 4 10
Central Electricity 4½% Deb. ...	Stock	4½	4½	104	—	4 6 7
Charing Cross Ordinary	1	8½	8½	33/–	+1/–	4 4 10
Chelsea	1	8⅝	8⅝	33/6	+1/6	4 3 7
City of London	1	10	10	45/6	+1/–	4 7 11
Clyde Valley	1	8	7	32/–	—	4 7 6
County of London	1	11	10½	51 3	—	4 1 10
Edmundsons' 7% Pref.	1	7	7	30/–	—	4 13 4
Elec. Dis. Yorkshire	1	9	9	41/3	—	4 7 4
Elec. Supply Corporation	1	11	11	55/–	—	4 0 0
Kensington Ordinary	1	8	8	33/6	+1/–	4 3 7
Lancs. Light and Power	1	6½	7	29/3	+6d.	4 15 9
London & Home Counties 4½% Deb.	Stock	4½	4½	107	—	4 4 1
London Electric	1	9	9	33/–	+1/–	4 4 10
Metropolitan	1	10	10	48/9	—	4 2 0
Midland Counties	1	7	7	33/9	—	4 3 0
Mid. Elec. Power	1	8	8	35/9	—	4 9 5
North Eastern Electric Ordinary	1	6	6	28/–	—	4 5 9
Do. 7% Pref.	1	7	7	31/6	+6d.	4 9 0
Northampton	1	10	10	48/9	—	4 2 0
Notting Hill 6% Pref.	10	6	6	12½	—	4 16 0
North Met. Elec. 6% Pref. ...	1	6	6	29/6	—	4 1 4
St. James' and Pall Mall	1	8	8	33/–	+1/–	4 4 10
Scottish Power	1	8	8	33/9	—	4 14 10
South London	1	8½	8½	33/–	+1/6	4 4 10
Urban Ordinary	1	7	7	33/9xd.	—	4 3 3
Westminster Ordinary	1	8½	8½	33/–	1/–	4 4 10
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	17/6	—	8 11 6
Yorkshire Elec.	1	8	8	40/–	–	4 0 0
HOME RAILS.						
Central London Ord. Assented ...	Stock	4	4	82½	—	4 17 0
Metropolitan	,,	3½	2½	60	—1	4 3 4
Do. District	,,	5	4½	65½	—	6 17 5
Underground Electric	1	8	7	19/6	—	7 3 7
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	168½	+11	5 6 10
Anglo-Am. Tel. Pref.	Stock	6	6	105½	—	5 13 9
Do. Def.	,,	1½	1½	26½	—	5 13 2
Cables & Wireless 5½% Pref. ...	,,	5½	2⅝	82½	—2	3 6 3
Do. A 7½% Ord.	,,	—	Nil	32½	—	—
Do. B ord.	,,	—	Nil	14	—½	—
Globe Tel. and T. Ord.	10	8½	Nil	11¾	—¾	—
Do. do. Pref.	10	6	6	11⅞	—	5 1 1
Great Northern Tel.	10	20	20	28	—	7 2 10
Marconi-Marine	1	15	10	33/9	+1/3	5 18 6
Oriental Telephone Ord.	1	12	12	2⅛	—	*4 1 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	—	—	5/–	—	—
Do. do. 2nd Pref.	5	—	—	2/6	—1/3	—
Do. do. 5% Deb.	Stock	—	—	7	—	—
British Electric Traction Def. Ord.	,,	5	5	300	—	—
Do. do. Pref. Ord.	,,	8	8	135½	—	5 18 0
Brazil Traction	100	—	—	13	—	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	102½	—	4 17 6
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	11/3	—	—
London United Tram Deb. ...	Stock	4	4	67½	—	5 19 5
Mexico Trams, 5% Bonds... ...	—	5	5	45	—	11 2 2
Mexican Light Common	100	Nil	Nil	12½	—	—
Do. 7% Pref.	100	7	7	20	—	—
Do. 1st Bonds	—	5	5	69½	—	7 11 10
Victoria Falls Ord.	1	15	15	78/9	—	3 16 2
Yorkshire (West Riding)	1	Nil	Nil	5/–	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	30/–	—	5 6 8
Babcock & Wilcox	1	14	14	37/6	—	—
British Aluminium Ord.	1	10	5	25/–	—1/3	4 0 0
British Insulated Ord.	1	15	15	70/–	—	4 5 9
Brush Ord.	Stock	5	Nil	35	—	—
Callender's	1	15	15	3 5/8xd	—	4 10 6
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 6
Crompton Parkinson Ord. ...	5/–	30	24	21/3	—	5 13 0
Do. 8% Pref.	1	8	8	30/–	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/3	+1/–	6 3 8
Do. 5% Deb.	Stock	5	5	100	—	5 0 0
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	4 5/16	+ 1/8	5 9 7
English Electric	1	Nil	Nil	10/9	—	—
Do. do. Pref.	1	Nil	Nil	13/9	—	—
Ever Ready	5/–	35	35	29/–	– 1/–	6 0 8
Ferranti Pref.	1	7	7	23/6	—	5 19 2
G.E.C. Pref.	1	6½	6½	30/–	—	4 6 8
Do. ord.	1	10	8	40/9	—	3 18 6
Henley's	1	30	30	6½	+ 1/8	4 16 0
Do. 4½ Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/9	–	—
Johnson & Phillips	1	10	5	1	—	5 0 0
Siemens Ord.	1	7½	7½	26/3	—	5 14 3
Telegraph Construction	12	Nil	Nil	10½	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

20258. "Dynamo-electric machines." W. E. Evans (Allgemeine Elektricitäts-Ges.). July 14th, 1931. (382275.)

20549. "Electric motor control." International General Electric Co., Inc. July 18th, 1930. (382267.)

20622. "Sound transmitting devices, particularly loud speakers and telephone or like transmitters." Electrical Research Products, Inc. August 15th, 1930. (382268.)

20863. "Thermionic valve circuits." Marconi International Marine Communication Co., Ltd., and S. E. A. Landale. July 21st, 1931. (382286.)

20992. "Casings for dynamo-electric machines." W. E. Evans (Allgemeine Elektricitäts-Ges.). July 22nd, 1931. (382303.)

21058. "Thermionic valve amplifiers." Igranic Electric Co., Ltd., and L. H. Paddle. July 23rd, 1931. (382307.)

21148. "Electric signalling systems." Siemens Bros. and Co., Ltd., and H. E. Humphries. July 24th, 1931. (382312.)

21149. "Printing-telegraph apparatus." Creed & Co. (Teletype Corporation). July 24th, 1931. (382313.)

21241. "Thermionic generators." Wired Radio, Inc. February 11th, 1931. (382316.)

21452. "Television systems." Marconi's Wireless Telegraph Co., Ltd., and H. M. Dowsett. July 27th, 1931. (382326.)

21565. "Electric cable for telephone systems." Siemens Bros. and Co., Ltd., W. H. Grinsted, and S. S. Danks. July 28th, 1931. (382329.)

22594. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. August 10th, 1931. (382339.)

22789. "Electric cables." Callender's Cable & Construction Co., Ltd., and P. V. Hunter. August 12th, 1931. (382344.)

25161. "Electric fires." Bulpitt & Sons, Ltd., and W. H. Bulpitt. September 8th, 1931. (382369.)

25994. "Revolving stage light." F. L. Hall. September 17th, 1931. (382379.)

26380. "Junction boxes for electric cables." British Insulated Cables, Ltd., and R. W. Blades. September 26th, 1931. (382389.)

26957. "Methods of eliminating stray capacities in electrical apparatus such as is used in telephony." Telephon-Apparat-Fabrik E. Zwietusch & Co. Ges. October 20th, 1930. (382391.)

28083. "Automatic telephone systems." General Electric Co., Ltd., and G. W. Flynn. October 9th, 1931. (382404.)

28617. "Electrical tumbler switches." W. J. Charles, and Falk, Stadelmann & Co., Ltd. October 15th, 1931. (382407.)

29383. "Electric circuit control arrangements for lifting magnets." Igranic Electric Co., Ltd. October 30th, 1930. (382426.)

31124. "Electrical time-delay switching apparatus." General Electric Co., Ltd., and A. A. Chubb. November 10th, 1931. (382434.)

31354. "Alternating current telegraph systems." Siemens Bros. & Co., Ltd., and L. S. Crutch. November 12th, 1931. (382435.)

31857. "Acoustic filters or silencers." Electrical Research Products, Inc., and C. R. Keith. November 17th, 1931. (382438.)

33939. "Discharge tube for resistance amplifying." J. Kremenezky (trading as a firm). December 9th, 1930. (382454.)

35348. "Electromagnetic air-compressor or liquid pump, especially for high pressures." I. A. Rimstad and J. Teilmann. December 21st, 1931. (382460.)

35451. "Radio-transmitting systems." British Thomson-Houston Co., Ltd. December 22nd, 1930. (382461.)

35674. "Electrical accumulators or batteries." Pritchett and Gold and E.P.S. Co., Ltd., and E. S. Chapman. December 24th, 1931. (382463.)

35738. "Arrangements for measuring and plotting periodically varying voltages and currents." Siemens and Halske Akt.-Ges. March 21st, 1931. (382464.)

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619. "Broadcast and similar radio systems." A. Carpmael. (Siemens or und Halske Akt.-Ges. January 8th, 1932. (382474.)

1288. "Electric cookers." Maxim Soc. Anon. Fabrique d'Appareils Thermoelectriques. January 21st, 1931. (382479.)

1465. "Electrodeposition of metals, and cathodes suitable for such purpose." K. W. Palmaer. May 8th, 1931. (382482.)

3967. "Electromagnetically operated reciprocating devices, such as electric hammers." Igranic Electric Co., Ltd. February 20th, 1931. (382498.)

4019. "Sparking plugs for internal combustion engines." A. Tebaldi. August 11th, 1931. (382499.)

4349. "Electric spring contacts." E. Homberger. February 13th, 1932. (382502.)

6215. "Magnet systems for electro-acoustic devices, such as loud speakers or the like, comprising a permanent magnet." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 10th, 1931. (382514.)

6802. "Means for measuring the absorption of small quantities of material by means of X-rays." C. H. F. Müller Akt.-Ges. March 11th, 1931. (382518.)

6944. "Electron-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 24th, 1931. (382520.)

7512. "Receiving arrangement for the telemetering of magnitudes occurring in practical work." Landis and Gyr Akt.-Ges. March 18th, 1931. (382526.)

7937. "Dirigible head lamps for vehicles." R. P. Logan. March 17th, 1932. (382531.)

9811. "Electron discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 8th, 1931. (232540.)

10014. "Wireless receivers." H. F. Schwarz. April 7th, 1932. (382543.)

10147. "Electrical condensers." British Pix Co., Ltd., W. E. Debrunner, and R. W. Debrunner. April 8th, 1932. (Addition to 376158.) (382545.)

12920. "Means for mounting electric horns on vehicles." R. Bosch Akt.-Ges. May 30th, 1931. (382564.)

12923. "Electro-circuit breakers." J. J. V. Armstrong. (Soc. Francaise Gardy.) May 5th, 1932. (382565.)

13572. "Direct current welding apparatus." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 26th, 1931. (382568.)

15952. "Thermionic amplifiers." Marconi's Wireless Telegraph Co., Ltd. June 5th, 1931. (382579.)

19239. "Sound recording systems." Electrical Research Products, Inc. January 23rd, 1932. (382596.)

21449. "Circuit arrangement for the recording and reproducing coils of telegraphones." British Blattnerphone (Stille System), Ltd. July 30th, 1931. (382600.)

21810. "Single-phase synchronous motors." International General Electric Co., Inc. August 3rd, 1931. (382502.)

22226. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. August 7th, 1931. (382603.)

22814. "Electron discharge tubes." Igranic Electric Co., Ltd. August 15th, 1931. (Addition 367310.) (382605.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 9th.

Electro-matic. No. 532639, and Traff-O-Matic. No. 533712. Class 8. Street traffic signalling apparatus.—Automatic Electric Co., Ltd., Strowger Works, Milton Road, Liverpool.

Blue Spot 66K (lettering and design). No. 534830. Class 8. Loud speakers, loud speaker units, and gramophone pick-ups.—British Blue Spot Co., Ltd., 64-69, Rosoman Street, Rosebery Avenue, E.C.1.

Carnival. No. 535327. Class 8. Radio-telephonic receiving sets, radio-gramophones, and parts thereof.—General Electric Co., Magnet House, Kingsway, W.C.2.

Mettaflex. No. 535583. Class 8. Electric cables. No. 535584. Class 40. Wire insulated or sheathed with india-rubber and used for electrical purposes.—W. T. Henley's Telegraph Works Co., Ltd., 11, Holborn Viaduct, E.C.1.

Catkin. No. 535589. Class 8. Electric discharge tubes.—The M-O Valve Co., Ltd., Marconi House, Strand, W.C.2.

Measuring Lengths by Waves of Light

A PAPER entitled "A New Apparatus for Determining the Relationship between Wave-lengths of Light and the Fundamental Standards of Length," by Messrs. J. E. Sears, Jun., and H. Barrell, of the Metrology Department of the National Physical Laboratory, Teddington, has just been published in the Philosophical Transactions of the Royal Society; it contains some very interesting matter.

Light waves of a particular length are appreciated by the eye as having a particular colour. Some rays consist of waves uniform in length, which are known as monochromatic, the red ray from a cadmium lamp being especially good in this respect. A new apparatus, called the wave-length comparator, which is described in the paper, has been constructed at the National Physical Laboratory for comparing the length of a wave of this red light with the lengths of the present fundamental standards known as the Imperial standard yard and the international prototype metre.

It may be possible to supersede the present definition of the units of length, which is based on the distances between terminal lines marked on these standards, by a definition in terms of the "natural" standard offered by the wavelength of a monochromatic ray of light. Among the advantages of this change are the avoidance of the risks of variation and damage associated with material standards. The present Imperial standard yard is believed to have changed its length by about two ten-thousandths of an inch since it was constructed.

Another important advantage of the new unit lies in the increased precision it affords in the measurement of length. Since there are over 1,400,000 waves of the red ray of cadmium contained in the yard length, and this number can be measured in the new comparator to better than one-twentieth of a wave, the accuracy of measurement corresponds to one part in 30,000,000 or about one-millionth of an inch in a yard. Such highly accurate measurement can only be performed when the apparatus is at a uniform, constant and accurately known temperature, and for this reason it is surrounded by a specially designed enclosure in which the temperature of the air is controlled and measured with great precision.

Practical measurements of length would not be appreciably affected by the change in the definition of the unit, for the new comparator, which consists of a rather complicated system of optical apparatus, would be employed solely for keeping a very sensitive check on the material standards of length (or to establish new standards should the present ones be destroyed). The demand for increasing accuracy in industrial measurements makes an improvement in the accuracy of definition of the fundamental units of length a practical desirability, as for the best class of gauge work measurements in millionths of an inch are required.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abingdon.—Housing scheme; borough surveyor.
Ambiecote.—Houses (24); U.D.C. surveyor.
Angus.—Reconstruction of Glamis Parish Church (£2,700); E. Bennet, Mitchell & Son, architects, Aberdeen.
Ascot.—Extensions, Royal Ascot Hotel; Berkshire Hotel Co., Ltd.
Ashton-in-Makerfield (LANCS).—Premises for Bryn Gates Co-operative Society, Ltd., Bolton Road, Bamfurlong, Wigan.
Bebington & Bromborough.—Houses (180), Higher Bebington; U.D.C. surveyor.
Beckenham.—Completion of St. John's Church, Eden Park; vicar of Christ Church.
Bexhill-on-Sea.—Houses, Southcourt Avenue; W. C. Greed, builders, Collington Avenue.
Billingham-on-Tees.—Houses (66); J. Hill, U.D.C. surveyor, Council Offices.
Birmingham.—Alteration of factory premises, for Hall and Parkes, Ltd., Loveday Street; Whittall & Sons, builders, Lancaster Street. Extensions to bazaar premises for Marks and Spencer, Ltd., Carrs Lane; Bovis, Ltd., builders, Upper Berkeley Street, W.1.
Bishop Auckland (DURHAM).—Extensions, Poor Law Institution (£25,847); county architect.
Bolton.—Extensions to the Crown Street Corn Mills for H. Whitehurst & Sons, Ltd.; T. E. Smith & Son, architects, Central Chambers, Fold Street.
Bournemouth.—Three shops and houses, Sea Road, Boscombe; F. A. Wilkes. Alterations to Theatre Royal, Albert Road; D. Allen & Sons, Theatres, Ltd. Additions to Overcliffe Hotel, Grand Avenue; R. & M. Foulsham. Nursing accommodation, Poor Law Institution (£2,515); new department, Stourfield School; and rebuilding of East Beach Café; borough engineer.
Bradford.—Extension of the Congregational Church, Buttershaw; L. & H. Morrell, builders, Thornton.
Bristol.—Houses, Airport Road frontage; A. W. Kemp, builder, Keynsham. Civic buildings, College Green (£293.000); V. Harris, architect.
Burton-on-Trent.—Alterations to Queen's Hotel, Bridge Street, for Marston, Thompson & Evershed, Ltd., Snobnall Road.
Canterbury.—Cinema for Major C. H. Bell; C. A. Aish, architect, 22, Bedford Street, W.C. Cinema, for Cinema Services, Ltd.; V. Burr, architect.
Cheltenham.—Greyhound racing track and sports stadium, Kayte Farm Estate, for the Greyhound & Sports Holding Co., Ltd., 115, Shaftesbury Avenue, W.C.
Cheshire.—Extensions to the Technical School, Hyde, for the County E.C.
Cockermouth.—Additions to Co-operative Wholesale Society's premises, Maryport; H. Oldfield, architect, 1, John Street, Workington.
Derbyshire.—Additions, Chesterfield Technical College (electrical installations); Evans Bros. & Co., builders, Riddings, Alfreton.
Douglas (I.o.M.).—Alterations to Hotel Marlborough, Central Promenade; L. Stott.
Durham.—Council School (388 places), Carr House Estate, Seaham Harbour; F. Willey, architect, 34, Old Elvet.
Ealing.—Houses (20), Clauson Avenue, Wood End Lane, and Russell, Reading and Arterial Roads; Gradwell & Co., Ltd., Farnham Road, Slough, Bucks. Houses (30), Ribblesdale Avenue; J. & H. J. Boothman (1930), Ltd., Perivale Lane, Greenford. Houses (68), Torrington Road and Thorneville Terrace, for the Hillingdon Estates Co.; Swannell & Sly, architects, Rickmansworth, Herts. Coach station and repair works at Craven Road for the Ealing Coaches, Ltd.; C. & S. Construction Co., Bridgeway House, W.6. Dairy distributing depôt, Ruislip Road; Express Dairy Co., Ltd. Garage, Hanger Lane, for Chain Garages, Ltd.; O'Donoghue & Halfhide, architects, 5, Great Turnstile, High Holborn, W.C.1. Research laboratory for the Goodlass Wall and Lead Industries, Ltd., Wadsworth Road; T. P. Bennett & Son, architects, 41, Bedford Row, W.C.1.
Essex.—Senior school, Clacton-on-Sea; director of education, Chelmsford. Cinema, shops and flats (£27.000); G. H. B. Gould, architect, Hurlingham Chambers, Station Road.
Evesham.—Houses (36); R. J. Atkinson, R.D.C. surveyor, 64, Port Street.
Farnham (SURREY).—Houses (32), Trapes; U.D.C. surveyor.
Fifeshire.—Extensions for the Elie Hotel Co., Ltd.; Mr. Ockleford, architect, Edinburgh.
Glasgow.—Houses (1.356), for the Glasgow Estates Development Co., Ltd., 12, Old Dalmarnock Road; J. Wilson, architect. Houses, Cardonald; Glasgow Estate Development Co., Ltd. Houses, Knightswood and Shieldhall Roads; Housing Department architect. Bank, Paisley Road; British Linen Bank, Ltd. New factory buildings for Sandeman's Varnish, Ltd., 169, Murano Street; manager. Shops, Knightswood, for the Clydebank Co-operative Society, Ltd.; Stewart & Paterson, architects, 16, Blythswood Square.
Guisborough (YORKS).—Laundry (£10,000), Guisborough Laundry Priory Dyeworks, Northgate.
Hanley (STAFFS).—Arcade of shops, Lame Street and Stafford Street, for McIlroy's Stores (Hanley), Ltd.; Wood & Goldstraw, architects, Town Hall, Tunstall.
Hyde.—Extensions to Back Bower Hospital; borough engineer. Extensions to Rexine Works; Imperial Chemicals, Ltd.
Ipswich.—Houses (50), Gainsborough Estate; Building and Public Works Construction Co., Ltd., Swindon. Hospital extension (£2,296); G. A. Kenney & Sons.
Kelso (ROXBURGHSHIRE).—Hall; burgh surveyor.
Kendal.—Alterations to boot factory for Somervell Brothers, Ltd., Netherfield Works; G. A. Barnett, architect, 76, Albion Street, Leeds.
Kent.—Improvements to various county secondary schools (£43,770); county architect, Maidstone.
Leeds.—Catholic school, Halton Hill; Mount St. Mary's R.C. Trustees.
Liverpool.—Cinema, Stadium site, Pudsey Street; F. Verity, architect, 7, Sackville Street, Piccadilly, W.1.
London.—(LEYTON).—Public baths (£67,253) for T.C.; J. & J. Dean, Ltd., builders, Ruckholt Road. (WESTMINSTER).—Flats, Pulford Street, for Westminster Housing Trust, Ltd. M. Harvey, architect. Improvements to Westminster Cathedral R.C. School; managers.
Macclesfield.—Shops and bazaar premises, Mill Street, for Marks & Spencer, Ltd.; N. Jones & Rigby, architects, Williams' Deacons Bank Chambers, Lord Street, Southport.
Machynlleth (MONT).—Hospital; C. F. Ellis, architect, Aberdovey.
Newton Abbot (DEVON).—Houses; B. H. Palmer, architect, 11, Union Street.
Oakengates (SALOP).—Houses (20); M. Lee, U.D.C. surveyor.
Plymouth.—Mental hospital, Blackadon (£38,000); city architect.
Portsmouth.—Omnibus depôt, Eastern Road (£46,700); city engineer.
Preston.—Plaza Cinema (900 seats), New Hall Lane, for the Plaza Cinema (Preston), Ltd., 9, Chapel Street; Caton & Duckworth, builders, William Henry Street, Blackburn.
Prudhoe-on-Tyne.—Additions, Edgewell Hospital; G. Gazzani & Sons, builders, New Ridley Road, Stocksfield.
Rowley Regis.—Houses (146); U.D.C. surveyor.
Southall.—Houses, Mount Pleasant; U.D.C. surveyor. Houses (48), Rosecroft Road; G. Wimpey & Co., Ltd. Houses (195), St. Joseph's Estate, South Road; Sharon Development Co., Ltd.
South Shields.—Additions to clinic, Stanhope Road; J. P. Watson, borough engineer, Town Hall.
Stalybridge.—Clearance, Mount Pleasant area; borough engineer.
Steventon (BERKS).—Extensions to C.O.E. School; managers.
Stoke-on-Trent.—Reconstruction of North Stafford Hotel; L.M. & S. Railway Co.
Stourbridge.—Works extensions, Enville Street; Westwood, Dawes & Co.
Sutherland.—Houses for the C.C.; E. W. Brannen, architect, Dornoch.
Torquay.—Cinema, Torwood Street; Strand Cinema Co., Ltd. Development of Butcombe Estate, Maidencombe; T. J. Crossman. Pavilion extensions (£3,195); T. Vanstone & Sons.
Twickenham.—Additions to the Cole Court Hotel, London Road; Brewer, Smith & Brewer, architects, 11, The Green, Richmond.
Tynemouth.—Ten building sites, Balkwell Estate; J. F. Charlton.
Upminster (ESSEX).—Station; L.M.S. Railway Co.
Upton-on-Severn.—Houses (50); R.D.C. surveyor.
Wakefield.—Admission hospital, Wadsley Mental Hospital; Abbott & Bannister, Ltd., builders, 132, Machon Bank, Sheffield.
Wallasey.—Houses (35), Green Lane; Mrs. Raws. Block of flats, Seacombe Promenade; borough engineer. Development of Vyner Estate; P. Stephen. Reconstruction of Lyceum Cinema, King Street; Gaumont British Picture Corporation, Ltd.
Wallsend.—Completion of Bewicke Housing Estate; borough engineer.
Warborough.—Conversion of Shillingford House to children's home (£3,000); Oxfordshire Assistance Committee.
Warrington.—Seven shops; A. M. Ker, borough engineer.
Washington (DURHAM).—Houses (22), Heworth Road site; R. J. Swaddle, surveyor, Council Offices.
Weymouth.—Harbour buildings (£12,014); Bolton & Lakin, Ltd. Building estate, Rodwell Avenue; F. Greenaway.
Worcestershire. — Casual ward extensions, Bromsgrove, Evesham and Kidderminster (£2,500); county architect, Worcester.
Worthing.—Rehousing, Broadwater Street (£3,565); borough engineer.
York.—Houses (28,) Lilac Avenue; H. Williamson. Flats (40), Heworth Grange; city engineer. Estate development. Dringhouses; W. Simpson. Additions to Bishopsthorpe School; managers.

Unjustifiable Interference

The law of electricity supply in India contains a provision as it does in England, for a compulsory reduction of maximum charges made by any statutory undertaking. This was designed as a check on any tendency to take advantage of the quasi-monopoly by charging exorbitant rates. We are informed by a correspondent, well versed in Indian affairs, that this provision has been used to reduce not the maximum but the actual and reasonable rates charged by a company that has managed hitherto to pay modest dividends; the selling prices now imposed leave no margin to meet such contingencies as a rise in the price of fuel. The advisory board, whose report has been adopted by the local Government, included no technical men and did not even call for evidence from its own electrical inspector. Interference in this way with normal commercial operations is not likely to incline the company to take the risks necessary (and only practicable if it has a fair working margin of profit) for giving supplies in the not immediately remunerative parts of its area. And it is on the will to take such risks that the availability of electricity everywhere will depend